C20160-1576, Issue 3, March 1997

USER MANUAL

CYCLON 330-345 AIR COMPRESSORS

Serial Numbers from:

Cyclon 330	F166/0101	Cyclon 337	F167/0151	Cyclon 345	F168/0101

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OWNERSHIP DATA

TECHNICAL DATA

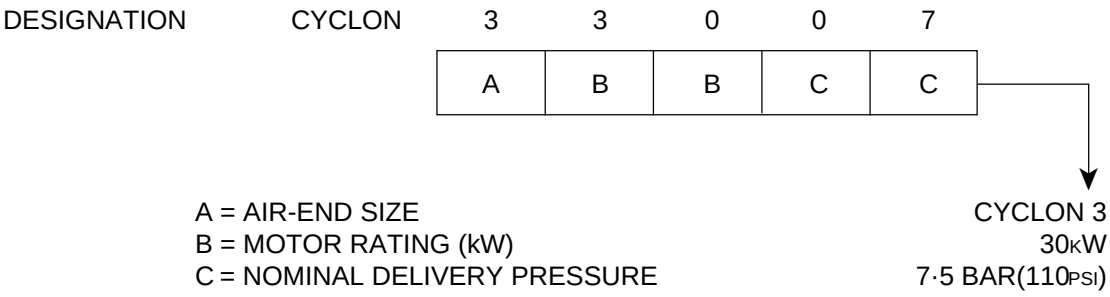
MODEL:	**Air-end Serial Number:**
Serial Number:	**Motor Serial Number:**
Year:	**Reclaimer Certificate Number:**
Maximum Pressure:	**Delivery Date:**
kW:	
Motor rpm:	**Compressor Lubricant:**
V. Ph. Hz.	**Lubricant Capacity:**
M^3/min:	**Motor Bearing Grease: (if applicable)**

LOCAL COMPAIR BROOMWADE DISTRIBUTOR

Name:		
Address:		
Telephone:		**Fax:**
Contact Names:	**Parts:**	
	Service:	

MODEL DESIGNATION

The Model Designation code identifies specific models as follows:



This publication relates to all standard operating pressure versions of the following models:

Cyclon 330 Cyclon 337 Cyclon 345

ASSOCIATED PUBLICATIONS

Model	Title	Part No.
Cyclon 105-345	Repair Manual	AC20160-1606 (Issue 1)
Cyclon 330 to 345	Parts List (Multi-Lingual)	C20160-1575 (Issue 2)

These publications may be obtained through CompAir BroomWade distributors.

WARRANTY

The conditions of the CompAir BroomWade Warranty are set out in the company's standard Conditions of Sale available from the Distributor supplying the machine.

MAINTENANCE

To ensure the continued trouble-free operation of the compressor unit it is important that periodic maintenance and servicing are carried out in accordance with the information given in the 'Maintenance' section of this manual. If any replacement or repair is needed use only CompAir-BroomWade Genuine Parts.

WARNING

- The use of replacement parts or lubricating oils not supplied or approved by CompAir BroomWade may lead to failures in service which would not be covered by warranty.
- Any unauthorised modifications or failure to maintain this equipment in accordance with the maintenance instructions may make it unsafe. The use of replacement parts not supplied or approved by CompAir BroomWade may create hazardous conditions over which CompAir BroomWade has no control.
- Such hazardous conditions may lead to accidents that can be life threatening, cause substantial bodily injury or result in damage to the equipment. CompAir BroomWade can bear no responsibility for equipment in which unapproved replacement parts are included.

USE ONLY

CompAir

GENUINE PARTS
AUTHORISED SERVICE AGENTS

1

SAFETY PROCEDURES

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SAFETY PROCEDURES

1. GENERAL

Most accidents which occur during the operation and maintenance of machinery are the result of failure to observe basic safety rules or precautions. An accident can often be avoided by recognising a situation that is potentially hazardous.

When handling, operating or carrying out maintenance on the unit, personnel must use safe engineering practices and observe all relevant local health and safety requirements and regulations. The attention of users in the UK is drawn to the Health and Safety at Work Act, 1974, the Regulations of the Institution of Electrical Engineers and the Pressure Systems and Transportable Gas Container Regulations 1989.

CompAir BroomWade cannot anticipate every possible circumstance which might represent a potential hazard. The **WARNINGS** in this manual are therefore not all-inclusive. If the user employs an operating procedure, an item of equipment or a method of working which is not specifically recommended by CompAir BroomWade he must ensure that the unit will not be damaged or made unsafe and that there is no risk to persons or property.

The standard build of all CompAir BroomWade products are not intended for use in either explosive or potentially explosive atmospheres as defined in Directive 94/9/EC.

An explosive atmosphere is a mixture with air, under atmospheric conditions, of flammable gases, vapours, hazes or dust in which, after ignition has occured, combustion propagates to the entire unburned mixture and may cause a hazard.

A potentially explosive atmosphere is an atmosphere which could become explosive due to local conditions.

Failure to observe the precautions given under ‘Safety Procedures’ may be considered dangerous practice or misuse of the compressor unit.

2. WARNINGS, CAUTIONS AND NOTES

2.1 Warnings

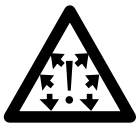
Warnings call attention to operations or procedures involving specific hazards which could cause injury or death and are identified by the following symbols on the unit and in the text of the manual.

WARNING: RISK OF DANGER

WARNING: RISK OF ELECTRIC SHOCK

WARNING: RISK OF HOT SURFACES

WARNING: CONSULT MANUAL



WARNING: RISK OF HIGH PRESSURE

WARNING: DRIVE BELT

2.2 Cautions

Incorrect operational procedures causing possible damage to the compressor unit are identified by a **‘CAUTION’** in the text of this manual.

2.3 Notes

Methods to make the job easier and points which require particular attention are identified by a **‘Note’** in the text of the manual.

3. GENERAL SAFETY PRECAUTIONS

If using compressed air for cleaning purposes, ensure safety regulations are complied with and appropriate clothing and eye protection is worn.

Never direct compressed air onto your skin or at other people.

Never use compressed air to clean loose dirt from clothing.

Before releasing compressed air through a hose make sure that the free end is held securely so that it cannot whip and cause injury.

Avoid injury by using a hoist to lift heavy loads. Check that all chains, hooks, shackles and slings are in good condition and are of the correct capacity. They must be tested and approved according to local safety regulations.

Cables, chains or ropes must never be applied directly to lifting eyes. Always use an appropriate shackle or hook, properly positioned. Arrange lifting cables so that there are no sharp bends.

Use a spreader bar to avoid side loads on hooks, eyes and shackles.

When a load is on a hoist stay clear of the danger area beneath and around it. Keep lifting acceleration and speed within safe limits and never leave a load hanging on a hoist for longer than is necessary.

4. INSTALLATION PRECAUTIONS

Installation work must only be carried out by competent personnel under a qualified supervisor.

A fused isolating switch must be fitted between the main power supply and the compressor.

Ensure that air drawn into the air intake will not be contaminated with flammable fumes or vapours, since this could cause an internal fire or explosion.

Precautions must be taken to ensure that no injury is caused to passers-by through loose clothing being sucked into the air intake.

Ensure that the air delivery pipe from the compressor to the user's pipework or receiver is free to expand and that no flammable material is within the vicinity.

A shut-off valve must be fitted in the delivery air line to enable the compressor unit to be isolated. This is particularly important if more than one unit is to be coupled in parallel or connected to an existing air supply system.

The minimum pressure/non-return valve is not intended as an isolating valve and should not be relied upon for this purpose. In addition, it may be necessary to install shut-off valves elsewhere in the system to allow a dryer or other equipment to be by-passed.

A pressure relief valve must be installed between any compressor unit and the shut-off valve/s. A pressure relief valve is fitted on the reclaimer vessel as standard equipment.

A pressure relieving device must be fitted to every pressure vessel, or equipment containing air at above atmospheric pressure, when installed downstream of the unit.

5. OPERATIONAL PRECAUTIONS

The compressor unit must only be operated by competent personnel under a qualified supervisor.

Do not run the compressor with doors open or covers removed.

Never remove or tamper with the safety devices, guards or insulation materials fitted to the unit.

The compressor must only be operated at the supply voltage and/or frequency for which it is designed.

When mains power is switched on, lethal voltages are present in the electrical circuits and extreme caution must be exercised whenever it is necessary to carry out any work on the electrical system.

Do not open the starter compartment or touch electrical components while voltage is applied unless it is necessary for measurements, tests or adjustments. Such work should be carried out only by a qualified electrician equipped with the proper tools and wearing appropriate body protection against electrical hazards.

On a unit equipped with an Automatic Start/Stop system, attach a sign stating **'THIS UNIT MAY START WITHOUT WARNING'** next to the display panel.

On a unit equipped with an Automatic Restart device, attach a warning notice stating **'THIS UNIT HAS BEEN MODIFIED AND WILL START AUTOMATICALLY ON APPLICATION OF POWER'** next to the display panel and on the inside of the unit next to the starter contactors.

If the unit is equipped with a Remote Control device, attach warning notices stating **'THIS UNIT CAN BE STARTED REMOTELY'** in prominent locations, one on the outside of the unit, the other inside the control compartment.

As a further safeguard, take adequate precautions to make sure there is no one checking or working on the unit before attempting to switch on remotely controlled equipment. Attach a **'CHECK THAT ALL PERSONNEL ARE CLEAR OF THE UNIT BEFORE STARTING'** or similar warning notice to the remote start equipment.

During normal operation no internal part of the compressor unit should reach a temperature above 120°C and protection devices are fitted to prevent excessive temperatures occurring. If there is any indication that the compressor is overheating it must be shut down and the cause investigated. Beware of burns from hot metal parts, hot oil and water when working on a unit which has recently been shut down.

The compressor must not be operated at pressures above the nominal pressure given on the data plate.

The compressor must not be operated in ambient temperatures outside of those given under 'Leading Particulars'.

The 'Noise at Work Regulations 1989' suggest that ear protectors should be worn where noise levels are 85 dB(A) or higher. With all covers in place, the noise levels of the compressors described in the manual are substantially lower than this figure unless installed in an already noisy environment.

Be aware that high noise levels can interfere with communication.

6. MAINTENANCE AND REPAIR PRECAUTIONS

Maintenance, repairs or modifications must only be carried out by competent personnel under a qualified supervisor.

If replacement parts are needed use only CompAir BroomWade Genuine Parts.

Before removing any panels from the enclosure, if fitted, or dismantling any part of the unit, carry out the following preparatory operations:-

1. Isolate the compressor unit from the main electrical power supply. Lock the isolator in the 'OFF' position and remove the fuses.

2. Attach a label to the isolator switch and display panel carrying the warning **'WORK IN PROGRESS – DO NOT APPLY VOLTAGE'** Do not switch on electrical power or attempt to start the unit if a warning label is attached.

3. Close the isolating valve between the compressor unit and the user's pipework. Close the isolating valve in the cooling water inlet pipe. Attach a label to each valve carrying the warning **'WORK IN PROGRESS – DO NOT OPEN'**

4. Ensure that the blowdown system has operated to release all pressure from the oil separator vessel.

5. Check that the pressure gauge registers zero.

Use only lubricating oils and greases approved by CompAir BroomWade. Make sure that the selected lubricants comply with all relevant safety regulations, especially with regard to the risk of explosion or fire and the possibility of decomposition or the generation of hazardous gases.

Always clean up oil spills from the surrounding floor and outside of the compressor unit before and after maintenance work.

Make sure that all instructions concerning operation and maintenance are strictly followed and that the complete unit, with all accessories and safety devices, is kept in good running order.

The accuracy of pressure and temperature gauges must be regularly checked. They must be renewed when acceptable tolerances are exceeded.

Protection devices must be tested as described in the 'Maintenance' section of this manual.

Keep the compressor unit clean at all times. Protect components and exposed openings by covering with clean cloth or tape during maintenance and repair work.

Protect the motor, air intake, electrical and regulation components against the entry of moisture, e.g. when steam cleaning.

Precautions must be taken when carrying out any repair operation which generates heat, flames or sparks. The adjacent components must always be screened with non-flammable material and if the operation is to be carried out near any part of the oil system, or close to a component which may contain oil, the system must first be thoroughly purged, preferably by steam cleaning.

Never use a light source with an open flame to inspect any part of the unit.

In no circumstances must any welding work or other modification be carried out on the oil separator or any other pressure vessel.

Before dismantling of any part of the compressor unit ensure that all heavy movable parts are secured.

After completion of repair or maintenance work ensure that no tools, loose items or rags are left on or inside any part of the machine.

Check the direction of rotation of the motor when starting up the compressor initially and after any work on the electrical connections or switchgear.

Do not use any flammable liquid to clean valves, filter elements, cooler air passages, air pipes or any component carrying a flow of air during normal operation. If chlorinated hydrocarbon non-flammable fluids are used for cleaning, safety precautions must be taken against any toxic vapours which may be released.

Do not use carbon tetrachloride.

Precautions must be taken when using acids, alkalis and chemical detergents for cleaning machine parts and components. These materials cause irritation and are corrosive to the skin, eyes, nose and throat. Avoid splashes and wear suitable protective clothing and goggles. Do not breathe mists. Ensure that water and soap are readily available.

When disposing of condensate, old oil, used filter elements and other parts and waste material of any kind make sure that there is no pollution of any drain or natural water-course and that no burning of waste takes place which could cause pollution of the air. Protect the environment by using only approved methods of disposal.

7. PRECAUTIONS IN THE EVENT OF FIRE

Use extreme caution when handling components that have been subjected to fire or very high temperatures. Some components may contain fluoroelastomer materials which decompose under these conditions to form highly corrosive residues. Skin contact can cause painful and penetrating burns resulting in permanent skin and tissue damage.

2

GENERAL DESCRIPTION

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GENERAL DESCRIPTION

1. COMPRESSOR

The unit is a fully enclosed, air cooled, single-stage, rotary screw compressor. The compressor air-end is belt driven by an electric squirrel-cage induction motor. The drive belts are mounted on pulleys fitted to the shafts of the drive motor and air-end.

The compressor unit consists of the drive motor, air-end, oil separator vessel, oil separator filter, oil cooler, aftercooler, cooling fan, starter assembly and controller.

The complete compressor unit is mounted on a baseframe and is housed in a steel panelled acoustic enclosure. A service panel allows access for routine maintenance.

2. AIR-END (CYCLON 3)

The air is compressed in a single-stage, positive displacement, oil injected rotary screw air-end. The air-end is of the Cyclon type and comprises an intermeshing pair of helical screw rotors, male and female, mounted horizontally within an enclosed casing with drive being applied to the male rotor.

The male rotor in the Cyclon air-end is larger in diameter than the female rotor and has four lobes which mesh with five flutes on the female rotor. The rotors are asymmetric in profile to reduce blowback between the lobes on the compression cycle to a minimum, thus maximising overall sealing and efficiency.

The rotors are fitted with bearings at each end to provide radial and axial support, maintain adequate shaft stiffness and to give minimum clearance and low leakage between the rotor tip diameter and the casing.

At the delivery end the male rotor is fitted with a single taper roller bearing and the female rotor has a pair of matched taper roller bearings. These bearings provide axial and radial support of both rotors and control the very fine end clearances between the rotors and the casing.

Heavy duty parallel roller bearings are fitted to both rotors at the inlet end to provide radial support and to sustain the drive load of the male rotor.

3. ELECTRONIC CONTROLLER

The electronic control system is microprocessor based with an LED display panel, incorporating advanced control and monitoring features.

4. PROTECTION AND SAFETY EQUIPMENT

In addition to the protection and warning circuits linked to the control panel the following protection devices are fitted:

4.1 Relief Valve

A pressure relief valve is mounted on the primary oil separator. If pressure continues to build up when the demand for compressed air has ceased, the relief valve will open at a pre-set level to discharge the excess pressure to atmosphere.

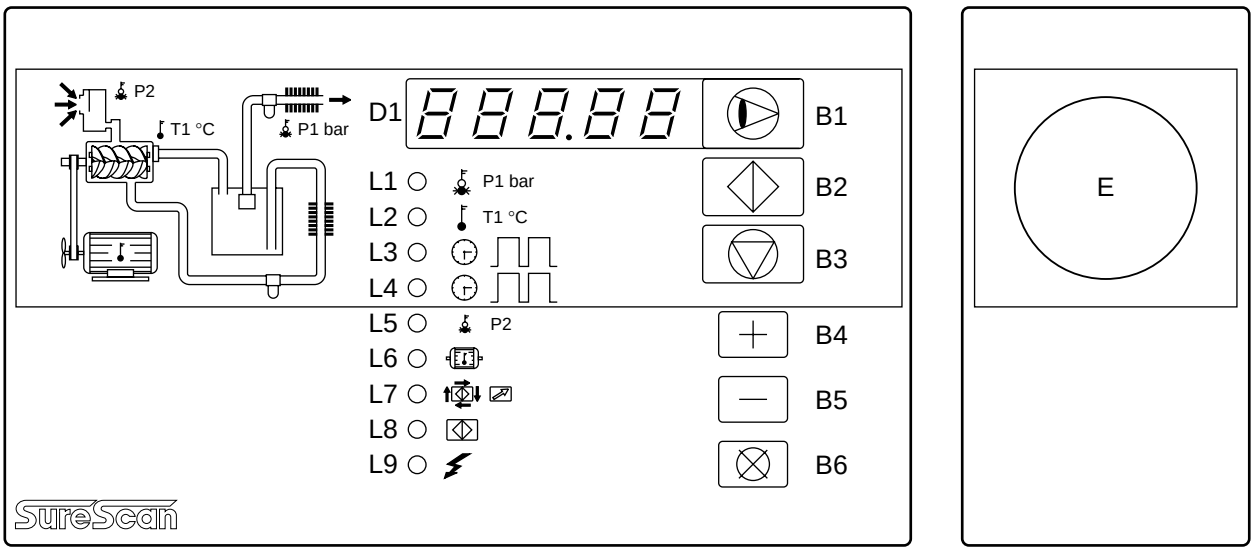
4.2 Blowdown System

Whenever the compressor shuts down, either automatically or by operation of a ‘STOP’ switch, all pressure in the oil separator vessel is automatically released by a blowdown system which vents the pressure to atmosphere. This ensures that the compressor is restarted in a no-load condition.

4.3 Minimum Pressure/Non-return Valve

Fitted on the filter manifold, the minimum pressure valve remains closed until minimum pressure is reached. This ensures a rapid build-up of pressure when the compressor first starts and also prevents high velocity, low pressure air reaching the user’s pipework during the start-up period and carrying over excessive amounts of oil.

When the compressor shuts down the non-return valve prevents the pressure in the user’s pipework feeding back into the oil separator and venting through the blowdown system.



B1	View	L1	Pressure (Delivery)
B2	Start	L2	Temperature
B3	Stop	L3	Hours Run
B4	Plus	L4	Hours Onload
B5	Minus	L5	Air Filter Alarm
B6	Reset	L6	Motor Fault
D1	Display	L7	Auto/Remote Start
E	Emergency Stop Button	L8	Running
		L9	Power On

CONTROL PANEL

5. AIR/OIL SYSTEM

5.1 Description

The air/oil system comprises an air intake filter, suction regulator, air-end, oil separator vessel, oil separator filter, minimum pressure/non-return valve, aftercooler, oil cooler with thermostatic bypass valve and an oil filter. The flow of oil through the circuit is achieved through the pressure differential existing between the primary oil separator and the oil injection point in the air-end.

5.2 Operation

Air enters the compressor unit through the intake filter (2) and open suction regulator (1) to the inlet port of the air-end (7). The air is trapped by the turning rotors and mixes with the oil which enters the casing through the oil injection point.

Continued rotor rotation increases the pressure and temperature of the air/oil mixture which passes from the air-end discharge pipe into the oil separator (4) where primary separation takes place by centrifugal force. Most of the oil is separated at this stage and drops to the bottom of the vessel.

The remaining air/oil mixture then passes through an oil separation element (5) where final separation takes place. The separated oil collects in the bottom of the filter and is scavenged back into the air-end through a small diameter pipe.

The filtered air then passes from the oil separator filter by way of the minimum pressure/ non-return valve (3). Provided the air pressure at this stage is above 3.5 to 4·0 bar the air passes through the aftercooler (9) where it is cooled before passing to the delivery outlet.

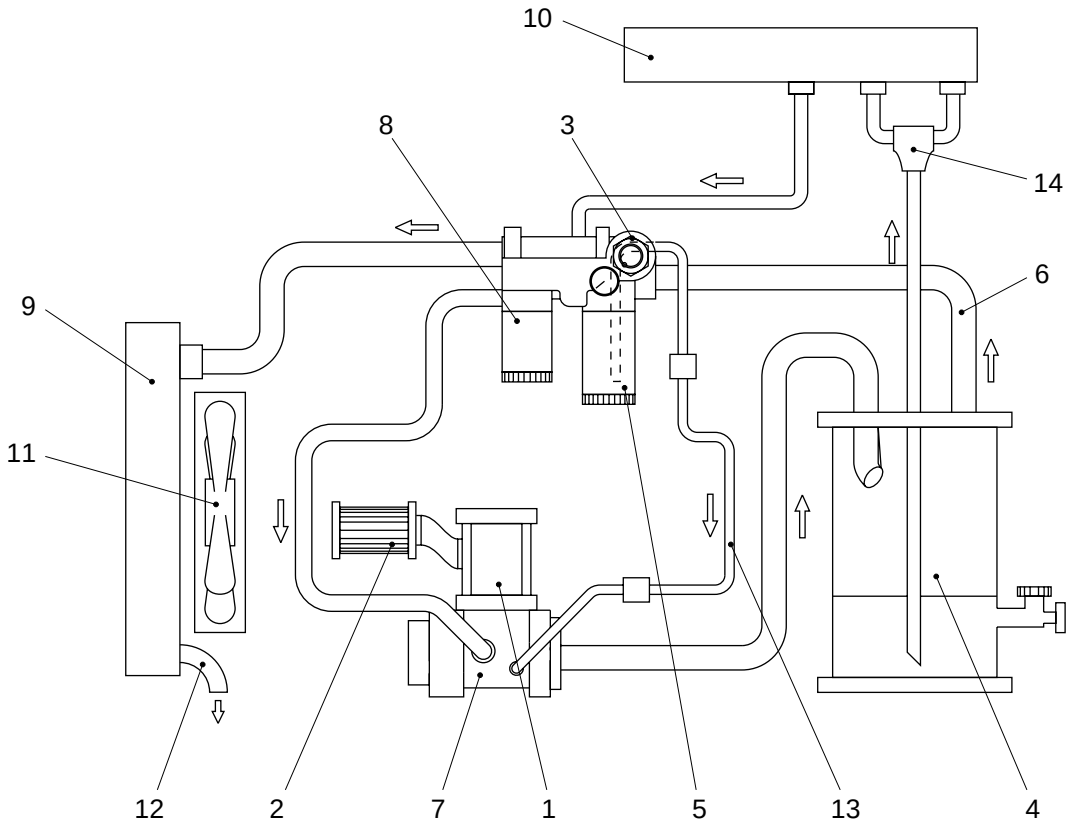
If the air pressure in the primary separator vessel falls below 3.5 to 4·0 bar the minimum pressure valve will close. The valve also incorporates a non-return valve which operates to prevent delivery air passing back into the separator when the compressor is running off-load.

Oil from the bottom of the separator flows under pressure to the oil cooler (10) and during normal running the oil passes through the cooler to maintain the correct temperature. A thermostatic bypass valve (14) is installed in the inlet manifold of the oil cooler.

When the compressor is started, the cold oil in the system bypasses the cooler and flows through the oil filter (8) directly to the air-end. As the oil and air mixture is compressed by the rotors in the air-end, the temperature of the oil increases.

When the oil has reached its normal operating temperature the bypass valve closes and the oil is directed through the oil cooler. The cooled oil then flows to the oil filter where it is cleaned before entering the air-end.

The quantity of oil injected into the air-end is controlled by a restrictor orifice in the air-end casing. Oil is injected under pressure through the restrictor orifice into the rotors and a gallery supplies oil to the air-end bearings.



1. Suction Regulator
2. Intake Air Filter
3. Minimum Pressure/NR Valve
4. Primary Oil Separator
5. Oil Separation Element
6. Discharge Pipe
7. Air-end
8. Oil Filter
9. Aftercooler
10. Oil Cooler
11. Fan
12. Delivery Air Outlet
13. Scavenge Line
14. Thermostatic Bypass Valve

AIR/OIL SYSTEM

6. REGULATION SYSTEM

6.1 Description

The compressor is regulated through a combination of electronic, pneumatic, electrical and mechanical devices. Two modes of regulation are used: 'On/Off' is fitted as standard, and 'Modulating' as an optional extra.

6.2 On/Off Control

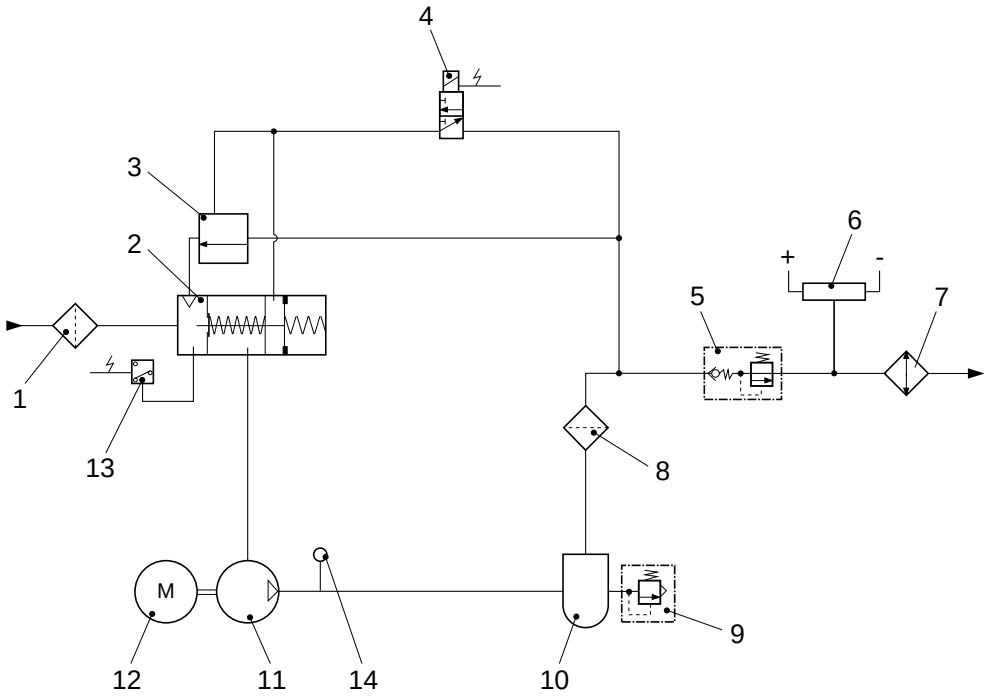
In the 'On/Off' mode, the compressor is regulated by the pressure transmitter, which continuously monitors the pressure in the user's pipework, a run-on time sequence within the controller and an unloader solenoid valve.

The compressor operates in response to varying air demand in either the on-load condition with the suction regulator inlet valve fully open, or off-load with the inlet valve fully closed.

When the controller switches the compressor to run off-load, a run-on time sequence is activated. This allows the compressor to run for a pre-set (adjustable) period of time in the off-load condition. If this time elapses before the pressure in the user's pipework has fallen to the lower set point, the compressor stops and enters the 'Standby' condition.

The compressor will remain in the 'Standby' condition until the pressure transmitter senses that the pressure in the user's pipework has fallen to the lower set point. The controller will then re-start the compressor.

If the pressure in the user's pipework falls to the lower set point before the run on time has elapsed, the controller will re-initialise the time sequence and switch the compressor to run on-load.



1. Air Intake Filter
2. Suction Regulator
3. Venting Valve
4. Unloader Solenoid Valve
5. Minimum Pressure/Non-return Valve
6. Pressure Transmitter
7. Aftercooler
8. Separator Filter
9. Pressure Relief Valve
10. Separator Vessel
11. Air-end
12. Drive Motor
13. Intake Pressure Switch
14. Air-end Discharge Temperature Sensor

REGULATION SYSTEM – ON/OFF CONTROL

6.3 Modulating Control (Optional)

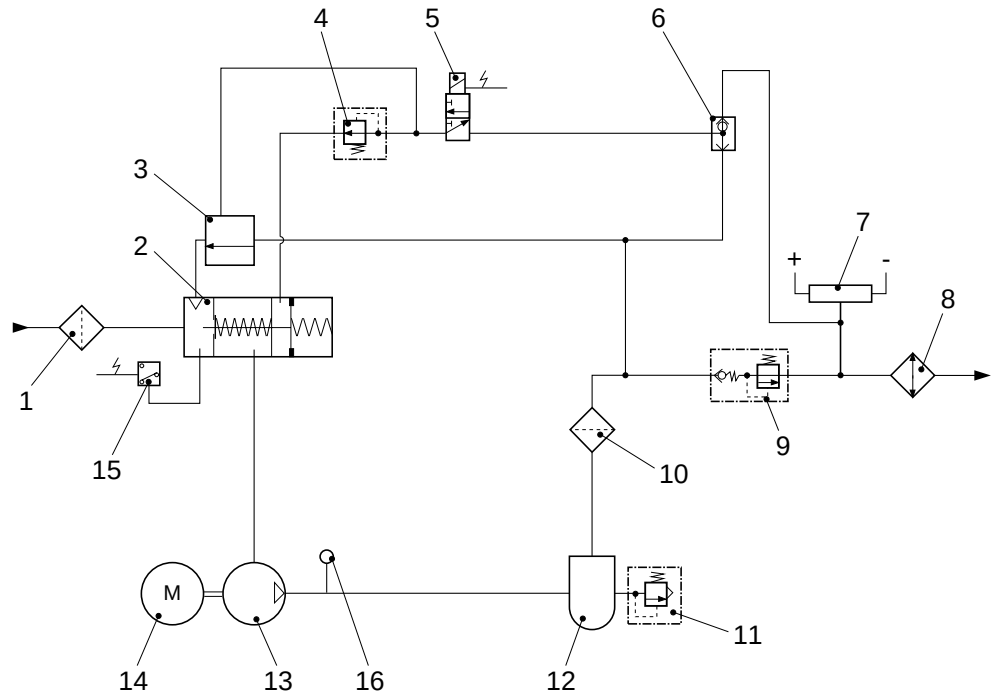
In the 'Modulating' mode the opening and closing of the suction regulator inlet valve is controlled by the negative regulator. As the demand for compressed air rises and falls, the valve modulates between fully open and fully closed.

When the compressor is started and runs up to load, the minimum pressure valve opens and air under pressure passes from the separator vessel into the user's pipework. If the air pressure in the user's pipework is below the setting of the negative regulator, the output signal from the negative regulator will cause the suction regulator inlet valve to open and the compressor will run on-load.

Rising pressure in the separator vessel will cause the output signal from the negative regulator to fall, progressively closing the inlet valve to match air flow to demand.

If the pressure in the user's pipework rises above the setting of the negative regulator and reaches the upper set point, the controller de-energises the unloader solenoid valve. The valve closes, shutting off the regulation air supply to the suction regulator. The suction regulator inlet valve closes and the compressor runs in the off-load condition.

When the pressure in the user's pipework falls to the lower set point the compressor reverts to running on-load.



1. Air Intake Filter
2. Suction Regulator
3. Venting Valve
4. Negative Regulator
5. Unloader Solenoid Valve
6. Shuttle Valve
7. Pressure Transmitter
8. Aftercooler
9. Minimum Pressure / Non-return Valve
10. Separator Filter
11. Pressure Relief Valve
12. Separator Vessel
13. Air-end
14. Drive Motor
15. Intake Pressure Switch
16. Air-end Discharge Temperature Sensor

REGULATION SYSTEM – MODULATING CONTROL

3

LEADING PARTICULARS

LEADING PARTICULARS

Model			**Cyclon 330**	**Cyclon 337**	**Cyclon 345**
Air-end	Single stage oil injected screw	Cyclon	3	3	3
Total oil capacity:		litres	17·0	17·5	18·5
Delivery air connection:	without optional flexible pipe with optional flexible pipe		Rp 1 ½ R 1 ½	Rp 1 ½ R 1 ½	Rp 1 ½ R 1 ½
Ambient air temperature operating range:	Minimum Maximum	°C °C	0 46	0 46	0 46
Delivery air pressure:	Minimum (all models) Maximum (see compressor data plate)	bar bar	5 7·5-13	5 7·5-13	5 7·5-13
Typical delivery air temperature above ambient (full load operation)		°C	4 - 5	6	7 - 8
Typical cooling air outlet temperature above ambient:		°C	20	23	27
Main drive motor	Nominal Rating (for actual rating see motor data plate) Nominal Speed	kW rpm	30 2970	37 2970	45 2970
Typical total input power	**Note:** For actual figures see compressor data plate	kW	35·1	44·0	54·1
Approximate weight of total package	DPV TEFV	kg kg	849 939	875 945	936 1043
Dimensions:	Length Width Height	mm mm mm	1420 990 1650	1420 990 1650	1420 990 1650
Average sound level	at 1 m (CAGI PNEUROP)	dB(A)	68	69	70

4

INSTALLATION

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INSTALLATION

WARNING

- Refer to the safety procedures before installation of the compressor unit.
- Lethal voltages are used in this equipment. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.

1. GUIDELINES

Study the installation information in the manual for the particular compressor concerned.

The compressor unit is supplied as a complete package and does not need securing to a foundation. However, the supporting floor must have a loading capacity sufficient to support the weight of the unit (see 'Leading Particulars').

Because in operation the compressor will release heat into the surroundings the compressor room should be of adequate size and have good ventilation. The recommended minimum sizes of room and ventilation openings can be estimated as follows:

From 'Leading Particulars' establish total input power (kW).

Room volume = 1·35 m^3 per input kW

Ventilation opening = 0·016 m^2 per input kW

Note: An equivalent discharge opening will also be necessary.

Example:

Cyclon 337 input kW = 44·0

Room volume = 44·0 x 1·35 m^3 = 59·4 m^3

Ventilation opening = 44·0 x 0·016 m^2 = 0·7 m^2

The ventilation inlet opening should be positioned as low down as possible. The outlet opening should be positioned as high up as possible, preferably in the roof or ceiling.

The air flow from the cooler outlet may be directed either vertically or horizontally simply by changing the position of the outlet duct which is secured by fasteners. The air can be ducted for a distance of up to 3 m if necessary without the need for an additional fan. Details are available on request from the local CompAir BroomWade distributor.

To allow adequate air circulation, provide a minimum of 1·5 m headroom above the compressor and a minimum of 200 mm clearance on the RH side. Compressors with horizontal cooling air discharge must have a minimum of 1 m and those with vertical discharge a minimum of 150 mm clearance at the back. There should be no obstruction of doorways, passages or walkways.

The only connections required to the compressor are as follows:

1. Electrical power supply, 3-phase plus earth.
2. Air delivery outlet to the user's main pipework using a flexible hose (optional) or solid pipe.

Model	Flexible Hose
330/337/345	C26151-36

Note: If solid pipe is used it must be connected directly to the outlet of the aftercooler and supported by the first clamp or support, at least 1 m from the compressor discharge.

If the compressor is to be coupled in parallel with another compressor or connected to an existing air supply system, additional steps must be taken as set out in the 'Safety Procedures' section of this manual.

If air usage is intermittent or rapidly fluctuating so that the instantaneous demand for air is likely to exceed the compressor output rating, and if the volume of the user's pipework is small, it will be necessary to install a receiver of appropriate capacity.

As a guide, if the volume of the user's pipework is less than 1 m^3 a receiver of 875 litres minimum capacity should be installed.

To maintain rigidity during shipment, transportation fixings (painted red) are fitted to the drive module, for removal after installation.

2. INSTALLATION PROCEDURE

The following procedure gives guidance for installing a standard compressor unit. For the installation details for non-standard units or units equipped with optional equipment refer to the local CompAir BroomWade distributor.

1. Using a fork lift, lift the compressor unit and move it into position.

Note 1: If the unit is to be located in a RH corner carry out items 5 and 6 before moving into position.

Note 2: The use of a pallet truck is **not** recommended..

2. Lower the unit into place and check that it settles level to within 3 mm, using suitable packing pieces under the baseframe if necessary.

3 Release $^1/_4$ turn fasteners and remove the enclosure panels and packaging material to give access to the compressor.

4. Remove the transportation fixings (painted red) from the drive module. Remove all protective blanking covers and tapes.

5. A gland plate is fitted to the RH side of the starter box. Open the starter door and rotate the gland plate to the appropriate gland size, or remove the plate and and drill a hole to the required size in the spare space.

6. Make sure that the power supply to the compressor is taken from a fused isolator. The switch must be locked 'OFF' and the fuses removed.

   Connect the power supply to the compressor in accordance with the diagram supplied, using cables which comply with the standards of the International Electrotechnical Commission (I.E.C.) or local regulations.

   Pass the cable through the hole in the outer panel, then through the gland and gland plate before connection to the starter.

7. Connect the air delivery pipe to the user's pipework through an isolating shut-off valve.

8. Position the exhaust panel, blank panel and splitters between the top and bottom end panels. Reposition the splitters to discharge vertically or horizontally as required. Secure the fasteners.

9. Refit the starter compartment top cover and enclosure panels, or close the starter door.

5

COMMISSIONING

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COMMISSIONING

WARNING

- Refer to the safety procedures before commissioning the compressor unit.
- Lethal voltages are used in this equipment. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.

1. COMMISSIONING PROCEDURE

When commissioning a new compressor or re-commissioning a compressor which has been out of service, carry out the following procedures before attempting to start:

Note: We recommend that commissioning is carried out by a CompAir BroomWade distributor.

1.1 Preliminary Checks

1. Check that the isolator switch is locked 'OFF' and that all pipework and electrical power connections are correct and tight.
2. Release 1/4 turn fasteners and remove the top and side panels from the compressor.
3. Open the starter door and remove the perspex safety panel. Check all screws and connections in the starter area for security. Check all electrical connections are made correctly and are tight.
4. Ensure the main supply cables and fuse ratings comply with regulations.
5. Ensure the control transformer primary tapping connections are correct for supply voltage.
6. Ensure main motor thermal overload is set correctly for motor F.L.C. and supply voltage (if applicable).
7. Remove panels as required to gain access to motor connections. Inspect the motor and wiring connections to make sure they are correct and secure.
8. Check that all connections on the rear of the controller are correct and secure.
9. Check that all protective blanks and tapes have been removed.
10. Check the oil level and if necessary top up the separator vessel to the correct level with BroomWade approved lubricant (see Chapter 7 'Maintenance Procedures' para 3.4.2).
11. Refit panels as required. Refit perspex safety panel in starter compartment and close starter door.

Note: The drive belt tension is set at the factory and requires no further attention.

1.2 Pressure Calibration

Note: The values shown throughout these procedures are examples only. Ensure set values are compatible with the compressor model.

No.	Action	Reason	Display
1.	Switch power 'ON' at the isolator and allow the controller to initialise.		0.0 Bar
2.	Press the *STOP* button. even if the compressor is already stopped.		0.0 Bar
3.	Disconnect the air pipe from the pressure transmitter.	To apply 0.0 Bar to the pressure transmitter	0.0 Bar
4.	Press and hold the *STOP*, *PLUS* and *MINUS* buttons together.	To enter the Pressure calibration mode	0.0 Bar
5.	After five seconds indicators L1 to L8 will flash four times. When the indicators start to flash release the *STOP*, *PLUS* and *MINUS* buttons.	To enter Pressure calibration mode. The 0.0 Bar calibration set point is automatically set when pressure calibration mode is entered.	0.0 Bar
6.	Apply an accurately known pressure, above 5.5 Bar, to the pressure transmitter.	(example - 7.0 bar)	7.1 Bar
7.	Press *PLUS* or *MINUS* until the pressure display matches the applied pressure.	To calibrate the pressure transmitter to the applied pressure.	7.0 Bar
8.	Press *STOP*	To enter the pressure calibration into the controller memory. (The display will return to normal running mode).	7.0 bar
9.	Remove the slave air supply and re-connect the air pipe to the pressure transmitter.		0.0 Bar

1.3 Checking/Altering Program Mode Values

Note: The values shown throughout these procedures are examples only. Ensure set values relate to compressor model.

No.	Action	Reason	Display
1.	Switch power 'ON' at the isolator and allow the controller to initialise.		0.0 Bar
2.	Press the *STOP* button, even if the compressor is already stopped.		0.0 Bar
3.	Press and hold the *PLUS* and *MINUS* buttons together.	To enter Program mode	0.0 Bar
4.	After five seconds indicators L1 to L8 will flash four times. When the indicators start to flash release the *PLUS* and *MINUS* buttons.		0.0 Bar
5.	Indicator L1 will light and the display will show the upper pressure set point P1.		7.5 Bar
6.	Press *PLUS* or *MINUS* or go to step 8 if no adjustment required.	To adjust the displayed value	7.0 bar (pulsing display)
7.	Press *STOP*	To program the new value into the controller memory	7.0 bar (steady display)
8.	Press *VIEW*	To step to the next option	115°C
9.	Indicator L2 will light and the display will show the oil temperature trip set point.		115°C
10.	Press *PLUS* or *MINUS* or go to step 12 if no adjustment required.	To adjust the displayed value	110°C (pulsing display)
11.	Press *STOP*	To program the new value into the controller memory	110°C (steady display)
12.	Press *VIEW*	To step to the next option	
13.	Indicator L3 will light and the display will show the maximum service interval timer setting.		2000

No.	Action	Reason	Display
14.	Press *PLUS* or *MINUS* or go to step 16 if no adjustment required.	To adjust the displayed value	1500 (pulsing display)
15.	Press *STOP*	To program the new value into the controller memory	1500 (steady display)
16.	Press *VIEW*	To step to the next option	
17.	Indicator L4 will light and the display will show the solenoid valve 'open' time setting.		5.0
18.	Press *PLUS* or *MINUS* or go to step 20 if no adjustment required.	To adjust the displayed value	2.0 (pulsing display)
19.	Press *STOP*	To program the new value into the controller memory	2.0 (steady display)
20.	Press *VIEW*	To step to the next option	
21.	Indicator L5 will light and the display will show the lower pressure set point P2.		7.0 bar
22.	Press *PLUS* or *MINUS* or go to step 16 if no adjustment required.	To adjust the displayed value	6.5 bar (pulsing display)
23.	Press *STOP*	To program the new value in to the controller memory	6.5 bar (steady display)
24.	Press *VIEW*	To step to the next option	
25.	Indicator L6 will light and the display will show the compressor model		C215
26.	Press *PLUS* or *MINUS* until the displayed model matches the model number shown on the compressor data plate.	To adjust the displayed value	C330 (pulsing display)
27.	Press *STOP*	To program the new value in to the controller memory	C330 (steady display)

No.	Action	Reason	Display
28.	Press *VIEW*	To step to the next option	
29.	Indicator L7 will light and the display will show the Auto restart delay time.		0 secs
30.	If the auto restart facility is required press *PLUS* or *MINUS*. If the facility is not required set the display to 0 seconds, this will disable the facility.	To adjust the displayed value	60 secs (pulsing display)
31.	Press *STOP*	To program the new value in to the controller memory	60 secs (steady display)
32.	Press *VIEW*	To step to the next option	
33.	Indicator L8 will light and the display will show the Run-on time.		3 mins
34.	Press *PLUS* or *MINUS* or go to step 28 if no adjustment required.	To adjust the displayed value	5 mins (pulsing display)
35.	Press *STOP*	To program the new value in to the controller memory	5 mins (steady display)
36.	Press *RESET*	To exit Program mode.	0.0 Bar

1.4 Final Checks

No.	Action	Reason	Display
1.	Switch power ‘ON’ at the isolator and allow the controller to initialise.		0.0 bar
2.	Press *START*	To start the compressor and check direction of rotation	0.0 Bar
	CAUTION: Do not repeatedly start and stop the compressor.	May cause motor overheating, contactor damage or air-end seizure.	
	Note: The motor may appear to turn slowly for the first few revolutions before beginning to run up to speed. This is normal and should not be considered a fault condition.		

No.	Action	Reason	Display
3.	Press *STOP* as soon as the motor begins to rotate. **CAUTION:** Do not allow prolonged running in the reverse direction as damage will be caused.		0.0 Bar
4.	If the direction of rotation (marked by an arrow on the inside of the service panel) is incorrect, isolate the power supply and change over motor connections U1 and V1 on the main contactor and connections U2 and V2 on the delta contactor. Return to step 1.		
5.	Press *START* and run the compressor onload until the oil has reached working temperature. Check that the oil bypass valve operates correctly by feeling the rise in temperature of the LH header of the oil cooler (viewed from the service end) when the valve opens.		
6.	Press *STOP.* Check that the blowdown system operates correctly and that the pressure gauge registers zero when blowdown ceases.		
7.	Top up the oil in the separator vessel to the correct level.		
8.	Simulate a demand for air by opening a drain valve of the downstream air receiver, if installed, or opening a valve in the user's pipework.		
9.	Replace all compressor enclosure panels. **CAUTION:** The compressor will overheat if run without enclosure panels for any length of time.		
10.	Press START and run the compressor. Check that the compressor loads and unloads correctly according to the programmed pressure set points.		
11.	Check that the drain solenoid (if applicable) operates correctly according to the pre-set solenoid open and closed times.		
12.	Check that, after running off load for the programmed run-on time, the compressor stops in to Standby mode.		

No.	Action	Reason	Display
13.	Check that the compressor automatically re-starts when pressure falls below the lower pressure set point P2.		
14.	Run the compressor for 30 minutes. Check for air/oil leaks. (It will be necessary to remove the enclosure panels for short periods). Stop the compressor and rectify any leaks.		
	WARNING: RISK OF HIGH PRESSURE Do not use hands to locate leaks in the system. Always use a piece of paper or card for this purpose.		
15.	Stop the compressor and check that all enclosure panels are secure.		

2. NEGATIVE REGULATOR (Modulating Control Only)

During commissioning or after a period it will be necessary to adjust the delivery air pressure and the negative regulator as follows:

1. Open the shut-off valve to the user's pipework.

2. Create a downstream air bleed to simulate a demand for air by opening the drain valve of the downstream air receiver, if installed, or opening a valve in the user's pipework.

3. Remove the LH side panel to gain access to the negative regulator.

4. Switch the power supply 'ON' at the isolator.

5. Use the Program Mode to set the P1 and P2 set points.

Note: Set P2 at the required full flow delivery pressure and P1 at 0.4 bar above this pressure.

6. Start and run the compressor.

7. Release the locknut on the negative regulator spindle and turn the adjusting knob counter-clockwise until the inlet valve on the suction regulator starts to modulate.

8. Adjust the knob on the negative regulator clockwise until the suction regulator inlet valve modulates between P1 and P2 set points.

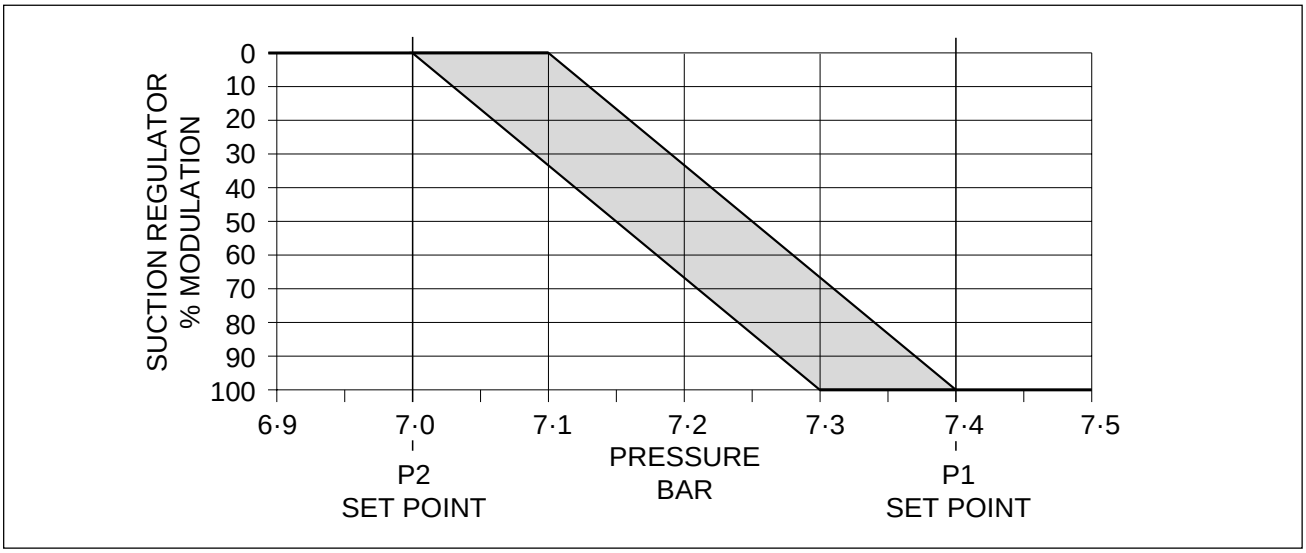
Note: The suction regulator must begin to modulate at the P2 set point (an example for 7.0 bar working delivery pressure is shown below).

9. Use the pressure display on the control panel for fine adjustment of the negative regulator.

10. Tighten the locknut on the negative regulator adjusting knob.

11. Refit the access door and close the receiver drain valve or other downstream valve used to simulate compressed air demand.

Note: The suction regulator must begin to modulate at, or before, the maximum working pressure rating of the compressor.



NEGATIVE REGULATOR SETTINGS

3. COMMISSIONING CHECK LIST

1. Protective blanks and tapes removed. .....
2. Pipework connected and checked. (Isolating valve fitted). .....
3. All electrical connections checked. .....
4. All control system connections checked. .....
5. Cable and fuse ratings comply with regulations. .....
6. Control transformer input voltage set correctly. .....
7. Overload set correct for motor size and voltage. .....
8. Oil level correct. .....
9. Air-end primed. .....
10. Drive belt tension correct. .....
11. Air-end and motor rotate freely. .....
12. Pressure transmitter calibrated. .....
13. Pressure set-points set. .....
14. Controller model option set. .....
15. Regulation air system isolating valve open. .....
16. Oil drain valve closed. .....
17. Motor rotation correct. .....
18. Corrosion inhibitor dispersed. .....
19. Compressor operation correct. .....
20. Oil/air fittings checked. .....
21. Oil temperature within limits. .....
22. Emergency stop checked. .....
23. Compressor test run for 30 minutes. .....
24. Oil level topped up. .....
25. All settings and options recorded. .....

6

OPERATION

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OPERATION

WARNING

- Refer to the safety procedures before operating the compressor unit.
- Lethal voltages are used in this equipment. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.

1. ROUTINE OPERATION

1.1 Starting

1. Switch mains power ON at the isolator. The display will show the control program identification and the Power on indicator (L9) will light.

2. After a few seconds the Delivery pressure indicator (L1) will light and the display will show the delivery pressure in Bar. See para 1.5 'Oil temperature and Hours run display'.

3. The Remote start/Auto restart indicator (L8) will light if the Remote start or Auto restart facilities have been selected. See para 4 'Control Function Options'. If a fault exists, one of the alarm or trip indicators will flash. See para 1.9 'Control Panel indicators' for possible start-up faults.

4. To start the compressor press *START* (B2).

CAUTION: Do not repeatedly start and stop the compressor.

Note: the compressor motor may appear to turn slowly for the first few revolutions before running up to speed. This is normal and should not be considered a fault condition.

5. Provided pressure at the delivery point is below the P2 pressure set point the compressor will start and run. If pressure is above the P2 set point the compressor will enter 'Standby' mode and the Start indicator (L8) will flash. The compressor will automatically start and run when delivery pressure falls below the P2 set point.

6. The compressor will not start from the front panel if the Remote start facility is enabled.

7. During the initial starting period, the drive motor starts in Star connection. Following the switch from Star to Delta a two seconds load delay time will occur before the compressor runs on load. The compressor will load and unload according to the delivery pressure set points P1 and P2.

Note: When the compressor is on-load, a small light will appear in the lower left hand side of the display to indicate the compressor is in the loaded condition. This is intended as a fault diagnostic aid only.

8. Initially the oil temperature will rise rapidly to working temperature, the thermostatic bypass valve will then operate to maintain the temperature at normal working level.

9. Fault conditions are continuously monitored from start-up and an alarm or trip indicator will flash if a fault occurs.

10. To interrogate the Oil temperature or to view the Hours Run press *VIEW* (B1). See para 1.5 'Oil temperature and Hours run display'.

1.2 Standby Mode

1. If the compressor is off-load for longer than the programmed 'Run-on time', the compressor will stop and the 'Start' indicator (L8) will flash slowly for a short period of time while the compressor blows down.

2. The Start indicator will flash quickly to indicate the compressor is in the Standby mode. The compressor will start automatically when the delivery pressure falls below the P2 pressure set point.

1.3 Stopping

1. To stop the compressor press *STOP* (B3). This initiates a controlled shut down sequence. The compressor will unload, the drive motor will stop and the Start indicator (L8) will flash slowly for the blowdown period. See para 2.3 'Program mode settings'.

2. The compressor motor cannot be re-started during the blowdown sequence. If *START* (B2) is pressed the start indicator will flash quickly and the compressor will enter the Standby mode and start automatically when the blowdown time expires.

CAUTION: The compressor should not be stopped during a start sequence.

1.4 Emergency Stop

1. When *EMERGENCY STOP* is pressed, the compressor will stop immediately and the unit will blow down.

2. Indicators L1 to L8 will flash to show *EMERGENCY STOP* has been pressed.

3. If the *EMERGENCY STOP* button is reset and *RESET* (B6) pressed during the blowdown time, the Start indicator will slow flash for the remainder of the normal blowdown time.

CAUTION: The Emergency Stop button should be used only in a genuine emergency and must not be used as the normal method of stopping the compressor.

1.5 Oil Temperature and Hours Run Display

1. When the compressor is in normal running mode indicator L1 will be lit and the display will show the delivery pressure in Bar.

2. To interrogate the oil temperature, total hours run or hours run onload, press *VIEW* (B1).

3. Each time *VIEW* is pressed the next indicator in the sequence L1 to L4 will light and the display will show the corresponding value.

Indicator	Display
L1	Delivery Pressure in Bar
L2	Oil Temperature in °C
L3	Total hours run
L4	Hours run on-load

The display will reset to show delivery pressure 60 seconds after *VIEW* is last pressed.

1.6 Service Interval Timer

The controller uses a countdown timer which can be reset to programmed maximum each time a service is carried out. The maximum reset hours can be adjusted to suit site conditions and/or service schedule requirements. When the timer reaches zero hours, indicator L3 will slow flash to indicate a service is due. When the service has been completed the service countdown timer can be reset by entering the program mode, selecting the service interval hours display (indicator L3), and pressing *STOP*. The service interval countdown timer will reset to the hours displayed on the program mode service interval setting. The service due alarm can be reset by pressing *RESET* after the above procedure has been completed.

The compressor must be stopped and the power isolated to carry out the required service (see 'Safety Procedures'). On completion of the service the service interval timer must be reset.

When in the normal running mode the 'hours remaining until next service due' can be viewed at any time. Press *VIEW* until indicator L3 is illuminated and the display shows the total hours run. Press and hold *PLUS* and the display will show the hours remaining until the next service is due until *PLUS* is released.

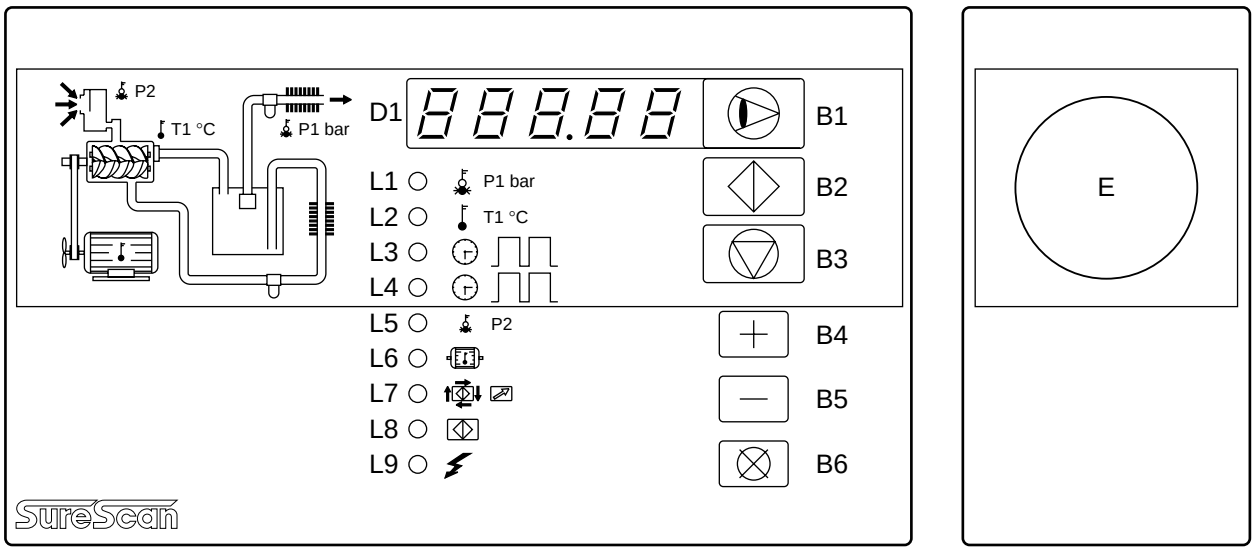
1.7 Alarms and Shutdown Trips

1. If an alarm condition occurs and service attention is required the appropriate alarm indicator will flash.

2. If a trip condition occurs the compressor will stop and the appropriate trip indicator will flash. This can occur any time after the compressor has been started. See para 1.9 ‘Control panel indicators’.

3. The oil temperature alarm and oil temperature trip conditions are shown by indicator (L2) flashing. Indicator (L2) will flash slowly for an alarm condition and the compressor will continue to run. Indicator (L2) will flash quickly for a trip condition and the compressor will shut down immediately.

4. The oil temperature alarm level is automatically set 10°C below the programmed oil temperature trip level. See para 2 ‘Program mode’.



B1	View
B2	Start
B3	Stop
B4	Plus
B5	Minus
B6	Reset
D1	Display
E	Emergency Stop Button
L1	Pressure
L2	Temperature
L3	Hours Run
L4	Hours Onload
L5	Air Filter Alarm
L6	Motor Fault
L7	Auto/Remote Start
L8	Running
L9	Power On

CONTROL PANEL

1.8 Power Supply Failure Detection

The controller is equipped with a power supply failure detection facility. If a power supply failure is detected, the compressor will stop, the controller will reset, and the display will show three horizontal lines in the left hand side of the display after the controller has re-initialised.

If the power failure Auto-restart facility is enabled, the compressor will automatically restart.

Note: This facility is designed to detect total loss of power, not a drop in normal supply voltage.

1.9 Control Panel Indicators

Indicator	When on (Steady)	When flashing
L1	Display will show delivery pressure	Excess pressure trip
L2	Display will show oil temperature	High oil temp alarm (slow flash) High oil temp trip (quick flash)
L3	Display will show total hours run	Service due
L4	Display will show hours run on-load	
L5		Change air filter alarm
L6		Drive motor trip
L7	Remote control / Auto restart enabled	Auto restart warning
L8	Compressor started	Standby (quick flash) Blowing down (slow flash)
L9	Main supply power ON	

2. PROGRAM MODE

2.1 Program Mode Routine

'Program mode' is used to access, view and/or alter the operating parameters and options stored in the memory of the controller.

1. To enter the 'Program mode' press *STOP* (B3) then press and hold *PLUS* (B4) and *MINUS* (B5) together.

2. After five seconds indicators L1 to L8 will flash four times to indicate that the controller has entered 'Program mode'. Release *PLUS* and *MINUS* buttons when the indicators start to flash.

3. After the indicators have flashed four times, indicator L1 will remain lit and the display will show the current upper pressure set point P1.

4. When *VIEW* (B1) is pressed indicator L1 will extinguish and indicator L2 will light. The display will now show the Oil temperature trip setting.

5. Each time *VIEW* is pressed the next indicator in the sequence L1 to L8 will light and the display will show the appropriate option.

6. To alter a displayed setting, press *PLUS* (B4) or *MINUS* (B5) to adjust the displayed value. The display will flash when an adjustment is made. When the display shows the required value, press *STOP* (B3) to enter the new value in to the controller memory. The display will show the new setting as a steady value.

Note: Any adjustment that is not entered into the controller memory by pressing *STOP* (B3) will be ignored and the original value maintained.

7. Press *RESET* (B6) to return to normal running mode.

2.2 Program Mode Setting Definitions

Indicator	Setting	Description
L1	Pressure set point P1	Pressure at which the compressor will unload.
L2	Oil temperature trip	Temperature at which the compressor will shut down and indicate a high oil temperature trip. (The oil temperature alarm is set automatically at 10°C below the trip)
L3	Service interval time	Maximum service interval time. Service due countdown timer will reset to this value each time a service is carried out and the timer reset.
L4	Solenoid 'open' time.	Time in seconds that the valve opens every cycle. The 'shut' time is fixed at 60 seconds.
L5	Pressure set point P2	Pressure at which the compressor will load.
L6	Model	Defines a number of fixed settings required by a particular compressor model. See para 2.4 ‘Fixed Parameters’.
L7	Auto Restart delay	The time between power being restored after a power failure and the compressor automatically re-starting. (Set zero time to inhibit the Auto-restart function).
L8	Run-on time	The time which the compressor will run in the off-load state before the main motor stops and the compressor enters Standby mode.

2.3 Program Mode Settings

Indicator	Setting	Unit	Minimum	Maximum	Step	Default
L1	Pressure set point P1	Bar	5.1	13.9	0.1	7.5
L2	Oil temp trip	°C	90	120	1	115
L5	Pressure set point P2	Bar	5.0	12.9	0.1	7.0
L6	Model	Model	C105	C345	option	C215
L7	Auto restart delay	seconds	60	240	1	0
L8	Run-on time	minutes	3	15	1	3

CAUTION: The model option must be set to match the compressor data plate.

The P1 pressure set point must **not** be set above the maximum design pressure stated on the data plate.

Note: The minimum Auto restart delay time is set according to the normal blowdown time of the compressor model.

2.4 Fixed Parameters

The motor star/delta time and blowdown time are set automatically, depending on the compressor model programmed in the controller.

Parameter	Unit	Model		
		C330	C337	C345
Star/Delta time	secs	5·0	5·5	6·0
Blowdown time	secs	25	25	25

Note: The blowdown time occurs when the drive motor stops. The compressor cannot be started during the blowdown time.

3. PRESSURE CALIBRATION MODE

3.1 Pressure Calibration Routine

The pressure calibration routine is used to calibrate the controller to the pressure transmitter to obtain an accurate pressure display reading when commissioning or re-commissioning the compressor and at each major service interval. The routine should also be used when renewing the controller or pressure transmitter.

1. Stop the compressor and isolate the compressor air delivery from the user's system.

2. Remove the air pipe from the pressure transmitter to establish a true zero pressure condition.

Note: Calibration will be affected if the air pipe is not removed before entering calibration mode.

3. Press and hold *PLUS* (B4), *MINUS* (B5) and *STOP* (B3) together.

4. After five seconds indicators L1 to L8 will flash four times to indicate that the controller is now in pressure calibration mode. Release *PLUS* (B4), *MINUS* (B5) and *STOP* (B3) when the indicators start to flash.

5. The display will show 0.0 Bar. If the pressure transmitter signal is outside of acceptable limits. The controller will automatically return to normal running mode and display a pressure transmitter fault.

6. Apply an accurately known pressure, above 5.5 Bar, to the pressure transmitter.

7. The display will not start to indicate a reading until the applied pressure is above 5.5 Bar.

8. Use *PLUS* (B4) and *MINUS* (B5) to increase or decrease the display reading.

Note: The controller will not allow the display to be adjusted outside of set maximum and minimum limits. The display will show four horizontal lines if the calibration limits are exceeded.

9. Press *STOP* (B3) when the pressure display matches the applied pressure. The display will return to normal running mode.

10. Press *RESET* (B6) at any time to abandon the calibration sequence and return to normal running mode.

11. Remove the pressure applied at Step 6.

4. CONTROL FUNCTION OPTIONS

4.1 Automatic Re-start

Automatic re-start will allow the compressor to start automatically after a break or failure in the mains power supply. When this facility is enabled the Remote start / Auto re-start indicator (L8) will be lit.

1. To enable Automatic re-start select an Automatic restart delay time of greater than zero seconds using the 'Program Mode'.

2. To disable Automatic restart select an automatic restart delay time of zero seconds.

3. When power is restored after a break or failure of the main supply power, the Remote start / Auto re-start indicator (L8) will flash for the programmed Auto re-start delay time. This provides a warning before the compressor re-starts. The compressor motor will automatically re-start and continue to run after the auto restart delay time expires.

4. The compressor will only automatically re-start if the compressor was in the On-load, Off-load or Standby mode when the break or failure in main supply power occurred.

4.1.1 Automatic Restart Delay Time

The Auto restart delay time can be adjusted using the 'Program Mode'.

In multiple compressor installations, staggered restarting can be achieved by adjusting the delay time of each compressor differently.

Example - Four compressor installation:-

Compressor	Autorestart delay time
1	60 seconds
2	120 seconds
3	180 seconds
4	240 seconds

4.2 Remote Start/Stop Facility

4.2.1 Remote Start

The remote start facility will enable the compressor to be started from a remote location.

1. When this option is selected, the Remote control/Auto re-start indicator (L8) will be lit and the *START* button (B2) on the compressor panel is disabled; all *STOP* functions are unaffected.

2. To enable the remote start facility connect a length of wire between terminal X2/1 and controller terminal X01, pin 7.

3. The compressor can be remotely started if remote start terminal X01, pin 4, is connected via a remote normally open button or other switching device, to terminal X2/1. The connection can be a pulse of at least 0·5 seconds or continuous.

4.2.2 Remote Stop

Note: Wire LK1 must be removed to enable the remote stop to function.

The remote stop facility will enable the compressor to be stopped from a remote location.

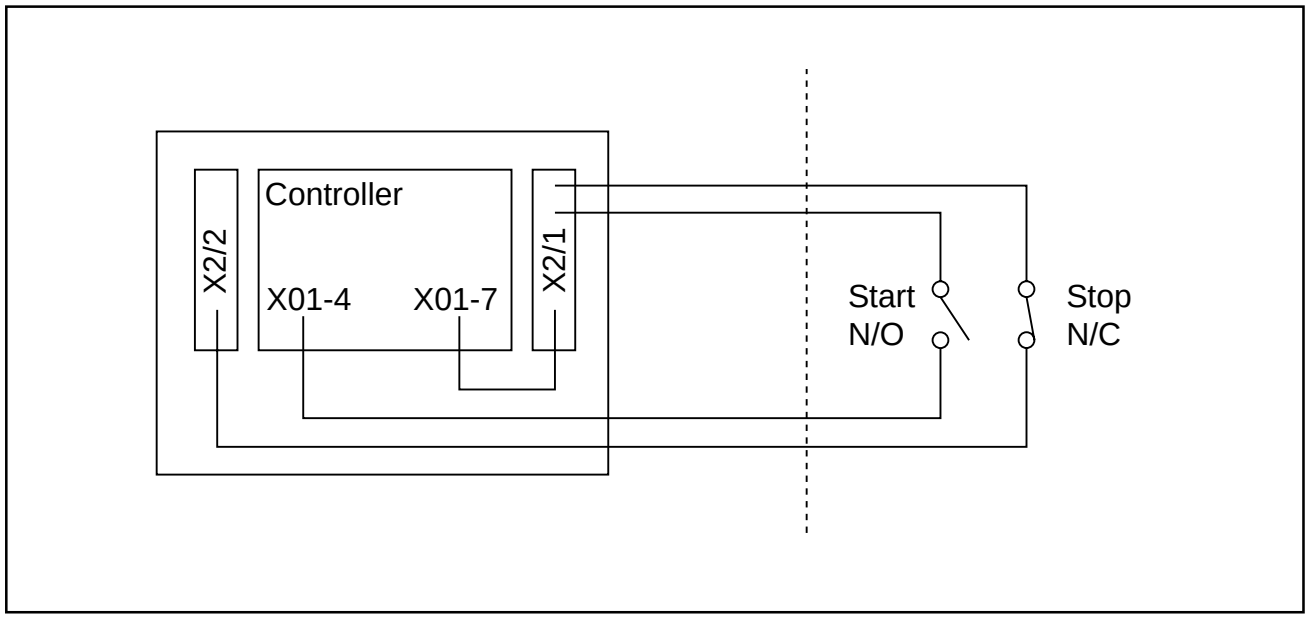
1. The remote stop is active at all times, regardless of the remote start facility being enabled.

2. The compressor can be stopped remotely by disconnecting the wire link between terminals X2/1 and X2/2 via a remote, normally closed button or other switching device.

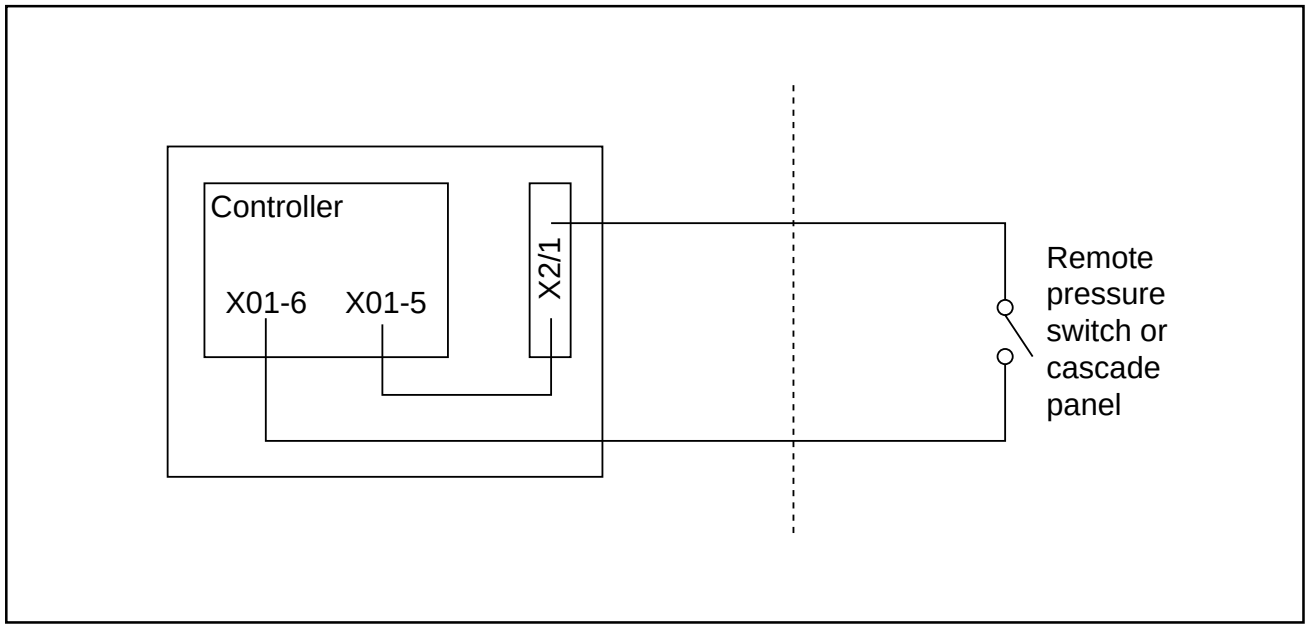
4.3 Remote Load/Unload

The remote load/unload facility enables the compressor to be pressure controlled by a remote pressure switch, pressure control system or cascade panel.

1. To enable the remote Load/Unload facility connect a length of wire between terminal X2/1 and controller terminal X01, pin 5.



REMOTE START/STOP



REMOTE LOAD/UNLOAD

2. When this option is selected the compressor will load when terminal X01, pin 6 is connected, via a remote pressure switch, cascade control panel or other switching device, to terminal X2/1.

3. The compressor will unload when the connection between X01, pin 6 and X2/1 is broken.

4.4 Remote Group Fault Output

4.4.1 Group Fault Relay

The control card is fitted with a group fault relay, the relay contacts being available for switching remote facilities. The relay contacts are rated for a maximum of 250V ac at 5A and are connected to controller terminal X08, pins 9 and 10.

4.4.2 Group Fault Relay Operation

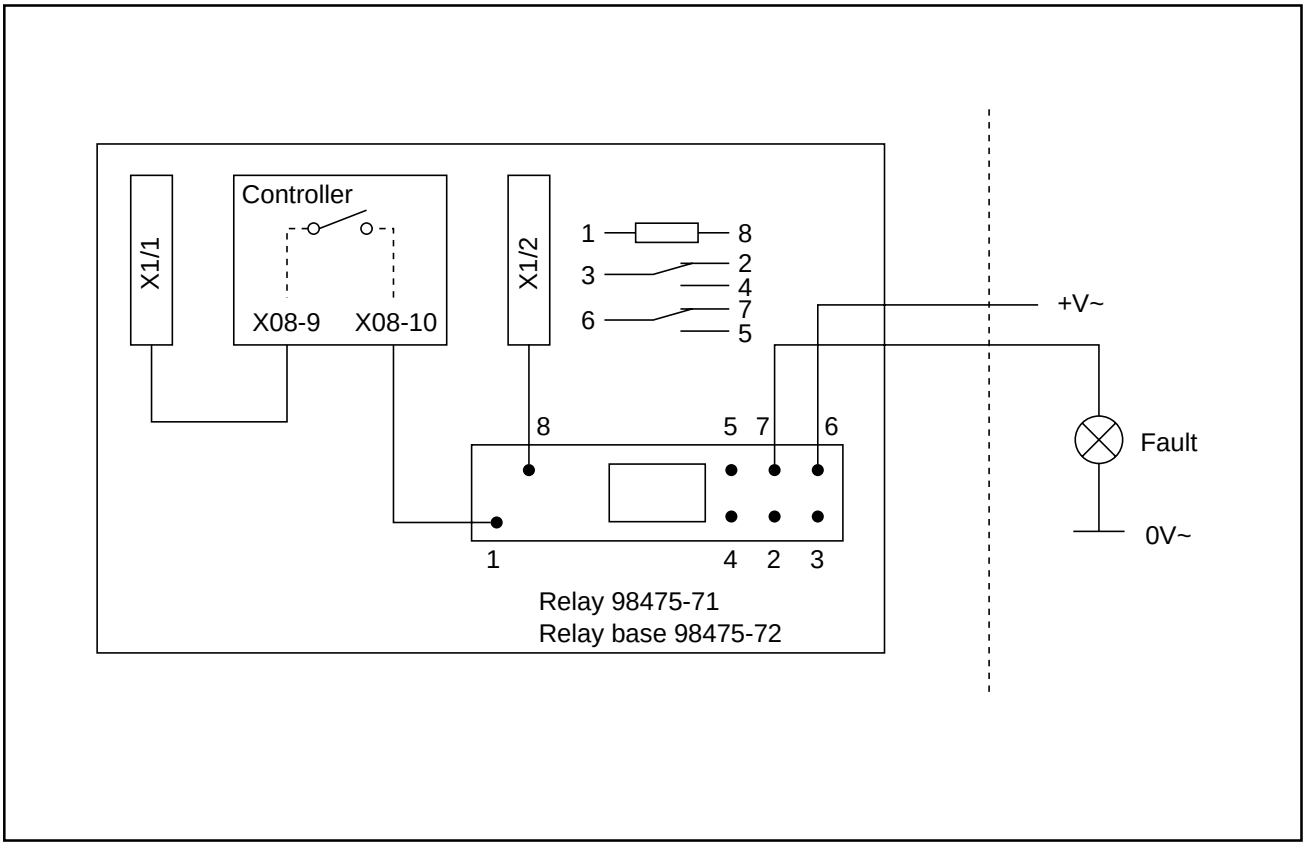
When power is switched ON, and no alarm or trip is detected, the group fault relay will energise and the contacts will close circuit. If an alarm or fault is detected or a power failure occurs, the relay will de-energise and the contacts will open circuit. The relay will energise again when the controller is reset and no further alarm or trip condition exists.

4.4.3 Group Fault Relay - Example

Remote wires (eg from a PLC or building management system) can be connected directly to the control card group fault relay contacts available on pins 9 and 10 of terminal X08.

If the output is used for switching a remote fault lamp or audible alarm, the group fault relay contacts will be required to operate in reverse. In this case an additional relay 98475-71 and base 98475-72 should be fitted, as shown in the diagram below. This will give a normally open remote contact which will close when a fault is detected or power failure occurs.

Note: If the compressor has been out of operation for a prolonged period it is advisable to carry out the full commissioning procedure before starting.



GROUP FAULT RELAY – EXAMPLE

7

MAINTENANCE

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MAINTENANCE

WARNING

- Refer to the safety procedures before carrying out any maintenance or servicing work on the compressor unit.
- Lethal voltages are used in this equipment. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.

1. ROUTINE MAINTENANCE

To ensure efficient operation of the compressor the performance must be checked regularly and adjustments made to maintain the correct settings. This section gives the information needed for this purpose.

A condition of the Warranty cover is for the user to ensure that routine maintenance and regular servicing must be carried out as recommended in the ‘Maintenance Schedule’ and an accurate record is kept of the work.

All CompAir BroomWade compressors are fitted with high performance filtration equipment. If the working environment is particularly dusty the filter elements and the heat exchangers will require more frequent attention.

1.1 Cleanliness

The compressor must be kept in a clean condition at all times. Make regular inspections for signs of damage, excessive wear and security of fittings. Ensure that any oil spillage is wiped up immediately and any residual oil cleaned from external surfaces.

1.2 Recording Pressures and Temperatures

Keep a regular daily record of the compressor operating pressure and temperature by noting the indicator readings, together with ambient air temperature, in a record book.

The readings should be taken when conditions are stable and with the compressor running on full load.

1.3 Maintenance Record

Keep a careful record of all servicing, maintenance and repair work carried out on the compressor unit. The record will form a useful reference.

1.4 Electrical Connections

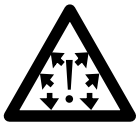
Regularly check for loose connections or frayed wiring. Clean and tighten all connections and repair or replace all frayed or damaged wires and cables before starting up.

Avoid damage to electrical wiring when working on the compressor and ensure no damage will be caused by chafing or contact with hot surfaces.

1.5 Leaks

Inspect for leaks, loose pipe connections and dirt build up prior to carrying out routine maintenance.

Tighten loose connections and repair or replace damaged pipes or hoses immediately.



WARNING: RISK OF HIGH PRESSURE

Do NOT use hands to locate leaks in the system. Always use a piece of paper or card for this purpose.

1.6 Lubricating Oil

It is essential to maintain the correct level of oil and to change the oil completely at the specified intervals. Details are given under ‘Maintenance Procedures’.

2. MAINTENANCE SCHEDULE

Regular maintenance should be carried out by your local CompAir BroomWade distributor as detailed in the Maintenance Schedule. The Schedule should be used as a general guide only.

Item	**Action**
Weekly	
Oil System	Check oil level. Top up if necessary.
Separator Element	Check separator element. Renew if on load pressure differential is 1 bar or above.
Aftercooler	Check condition of pre-filter and clean as necessary.
Minor Service – Every 2000 hours or 6 months (whichever is sooner)	
Minor Service	**Use correct Service kit for model.**
Oil System	Change oil if appropriate to type in use (see 3.4 'Oil System').
Blowdown System	Check operation.
Electrical Wiring	Check connections and condition.
Drain Solenoid Valve	Check operation.
Starter	Check connections and condition of contactors.
Aftercooler and Oil Cooler	Clean externally.
Drive Belt(s)	Check condition.
Oil Filter	Renew Oil Filter.
Air Filter	Renew Air Filter.
Interim Service – Every 4000 hours or 1 year (whichever is sooner)	
Service	Carry out Minor Service.
Separator Element	Renew separator element.
Major Service – Every 8000 hours or 2 years (whichever is sooner)	
Major Service	**Use correct Major Service Kit for model**
Service	Carry out Interim Service.
Minimum Pressure Valve	Service valve.
Suction Regulator	Service suction regulator.
Note: Renew the drive belt(s) every 16000 hours or 4 years, whichever is sooner.	

2.1 Separator Filter Part Number Table

Model Cyclon	Qty.	Max Rated Pressure (Bar)	Separator Filter
330/337 345	1 2	7·5 to 13 7·5 to 13	98262-223 98262-223

USE ONLY

CompAir

GENUINE PARTS

AUTHORISED SERVICE AGENTS

2.2 Service Kit Part Number Table

Model (Cyclon)	Service Kit	Major Service Kit
330/337 345	CK2003-2 CK2003-2	CK8003-2 CK8003-3

Note: Use Service and Major Kit for Major Service requirements

2.3 Drive Belt Part Number Table (50 Hz)

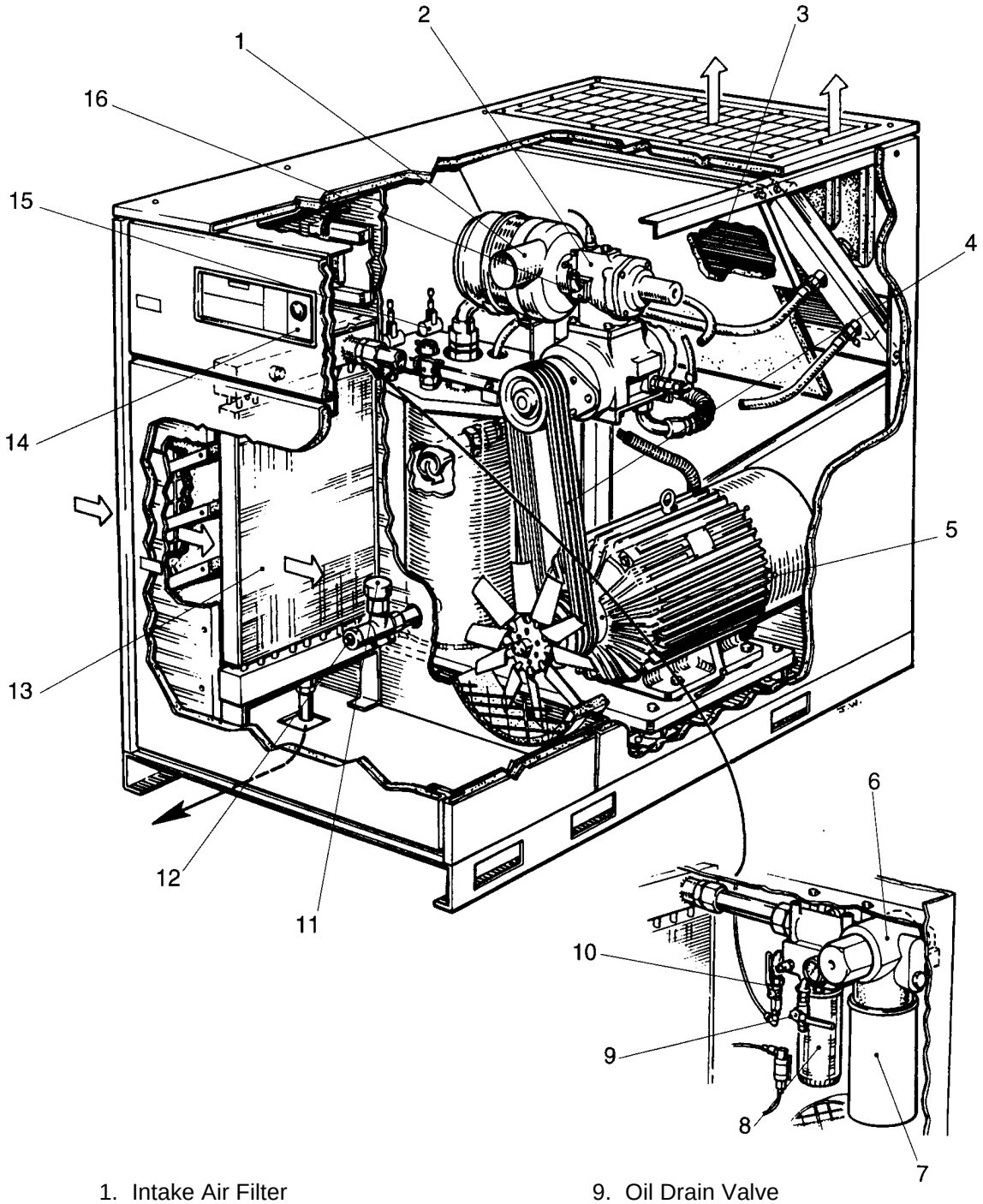
Model	Qty.	Maximum Rated Pressure			
		7.5 bar	8.2 bar	10 bar	13 bar
330 337 345	4 4 4	98080-152 98080-153 98080-155	98080-152 98080-154 98080-156	98080-152 98080-154 98080-156	98080-153 98080-155 98080-155

Note: See the compressor data plate for the compressor model and the maximum rated pressure.

2.4 Drive Belt Part Number Table (60 Hz)

Model	Qty.	Maximum Rated Pressure			
		7.5 bar	8.2 bar	10 bar	13 bar
330 337 345	4 4 4	98080-151 98080-153 98080-153	98080-152 98080-153 98080-154	98080-153 98080-154 98080-153	98080-153 98080-153 98080-155

Note: See the compressor data plate for the compressor model and the maximum rated pressure.



1. Intake Air Filter
2. Suction Regulator
3. Oil Cooler
4. Drive Belt
5. Motor Bearings
6. Minimum Pressure/Non-return Valve
7. Separator Element
8. Oil Filter Element
9. Oil Drain Valve
10. Control Air Isolating Valve
11. Oil Filler Cap
12. Oil Level Sightglass
13. Air Cooler
14. Display Panel
15. Belt Tensioner
16. Blowdown Valve

SERVICING POINTS

3. MAINTENANCE PROCEDURES

WARNING

- Refer to the safety procedures before carrying out any maintenance or servicing work on the compressor unit.
- Lethal voltages are used in this equipment. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.
- Where a maintenance procedure below includes the warning 'The compressor must be stopped' the following steps must be taken before work is commenced:

1. Close the shut-off valve to the user's pipework.
2. Switch the power supply 'OFF' at the isolator.
3. **Ensure that the blowdown system has operated to release all pressure from the oil separator.**

   Check that the pressure display and the pressure gauge(s) in the service area register zero.

3.1 Enclosure Filter

The compressor is provided with a coarse screen filter which acts as a pre-filter for the intake air.

Carry out a regular check on the condition of the pre-filter material and if necessary clean as follows:

1. Remove the LH starter side panel. Remove the filter element and wash it carefully in a mild detergent solution. Rinse thoroughly and allow to dry.
2. Refit the element and refit the side panel.

3.2 Air Intake Filter

Clean intake air is essential for satisfactory operation of the unit. Any ingress of unfiltered air will result in a reduction in the service life of the separator element.

Particular care should be taken during routine servicing to ensure that unfiltered air cannot bypass the air intake filter element via unsound joints and defective trunking, etc.

3.2.1 To Change the Air Filter:

1. Release the $^{1}/_{4}$ turn fasteners and remove the side panel to gain access to the intake air filter.
2. Remove the clips from the air intake filter and withdraw the element.
3. Fit the new element , secure the clip and refit the side panel.

3.3 Oil Separator Filter

The separator filter has a nominal service life of 4000 hours under normal operating conditions.

Adverse operating conditions or failure to carry out regular maintenance and/or correct operating procedures will affect the service life of the element.

3.3.1 To Change the Separator Filter:

The compressor must be stopped.

1. Open the door to the service area to gain access to the manifold block.

Note: Cyclon 345 has two separate filters both of which must be changed at the same time.

2. Unscrew the old separator filter(s) from the manifold block and discard the filter and sealing ring.

3. Apply a light film of oil to the seal of the new filter(s).

4. To fit the new filter(s), screw into the manifold block until the gasket contacts the sealing surface. Then tighten a further $^{1}/_{3}$ turn.

5. Close the service area door.

3.4 Oil System

3.4.1 Recommended Oil

The compressor is factory filled with BroomWade 4000 HR Oil or CompAir FG Lubricant.

1. *BroomWade 4000 HR Oil*
   This is a high performance oil with excellent lubrication and cooling characteristics formulated to maintain internal cleanliness, reduce the build-up of deposits on filter elements and extend component life.

2. *CompAir FG Lubricant*
   A synthetic hydrocarbon based lubricant which has been specially developed for use where discharge air may come into contact with foodstuffs or for reasons of health or environment. CompAir FG Lubricant meets the requirements of FDA regulation 21 CFR 178.3570 and is USDA H-1 approved.

The local CompAir BroomWade distributor will assist in the selection of an appropriate lubricant and in many cases will also be able to arrange for regular sampling of the oil to monitor the condition of the compressor, and to determine the oil change intervals to ensure optimum performance.

3.4.2 To Check the Oil Level:

To view the oil level sightglass, remove the front panel of the plant.

When stopped the mimimum level is indicated when the sightglass is less than half full. The maximum level is indicated when the sightglass is full and the oil reaches the bottom threads in the filler neck.

When running on-load the minimum level is indicated when oil is no longer visible in the sightglass.

If necessary top up the separator with oil as follows:

The compressor must be stopped.

1. Open the door to the service area.

2. Unscrew the filler cap.

3. Fill to the correct level with BroomWade approved lubricant.

4. Refit the filler cap and tighten by hand.

5. Close the service area door.

CAUTION: Always use the correct grade of oil and do not mix oils of different types.

3.4.3 To Change the Oil Filter:

The compressor must be stopped.

1. Open the door to the service area.

2. Unscrew the old oil filter from the manifold block and discard.

3. Apply a light film of oil to the seal of the new element and prime the new filter with oil.

4. To fit the new element, screw it into the manifold block until the gasket contacts the sealing surface. Then tighten a further $^{1}/_{3}$ turn.

5. Close the service area door.

6. Check oil level during initial run and top up if necessary.

3.4.4 Normal Oil Change

CAUTION: Always use the correct grade of oil and do not mix oils of different types.

1. *BroomWade 4000 HR Oil*
   Provided the air-end discharge temperature does not normally exceed 85°C CompAir 4000 HR Oil should be changed every 4000 hours service or 1 year, whichever is sooner.

   Where the air-end discharge temperature regularly exceeds 85°C then a change period of 2000 Hours or 6 months is recommended.

2. *CompAir FG Lubricant*
   Provided the air-end discharge temperature does not regularly exceed 85°C CompAir FG Lubricant should be changed every 4000 hours service or 1 year, whichever is sooner.

   Where the air-end discharge temperature regularly exceeds 85°C then a change period of 2000 Hours or 6 months is recommended.

Note: Where high dust levels and/or pollution are present the oil must be changed more frequently and the condition of the intake filtration system examined regularly.

3.4.5 To Change the Oil:

To drain the oil, the system must (a) be pressurised or (b) an alternative source of compressed air must be available.

CAUTION: Always use the correct grade of oil and do not mix oils of different types.

Method (a)

1. Run the compressor on load to pressurise the system.

2. Open the door to the service area.

3. Close the control air isolating valve,fitted to the side of the manifold block (lever to the vertical position) and the isolating valve in the user's system.

Note: A minimum of 4 bar (60 psi) must be maintained in the compressor unit prior to carrying out the oil drain procedure.

4. Stop the compressor. Wait until the motor has stopped rotating before proceeding.

5. Remove the plug and connect a hose (minimum 10 mm bore) to the drain tap and place the open end into a suitable container.

WARNING

- Risk of injury from hot oil under pressure.

6. **Slowly** open the drain tap and allow the oil to drain into the container for disposal.

7. Close the drain tap, disconnect the hose, and remove the container . Refit the drain tap plug.

8. Open the control air isolating valve (lever to the horizontal position) and allow any pressure to be released through the normal blowdown process.

9. Remove and discard the old oil filter element.

10. Prime the new filter with oil.

11. Apply a film of clean oil to the seal of a new oil filter element. Screw the element into the housing until it contacts the gasket and tighten a further $^{1}/_{3}$ turn.

12. Fill the separator to the correct level with BroomWade approved lubricant, refit the filler cap and tighten by hand.

13. Open the isolating valve to the user's system.

14. Run the compressor until it reaches working temperature to ensure full circulation of the oil.

15. Check the oil level and top up as necessary.

Method (b)

1. Open the door to the service area.

2. Close the control air isolating valve, fitted to the side of the manifold block (lever to the vertical position) and the isolating valve in the user's system.

3. Ensure that all pressure has been released from the oil separator, remove the filler plug and fit a suitable connector to the neck of the filler pipe for the air supply.

4. Apply pressure to the compressor unit (minimum of 4 bar or 60 psi).

5. Remove the plug and connect a hose (minimum 10 mm bore) to the drain tap and place the open end into a suitable container.

WARNING

- Risk of injury from hot oil under pressure.

6. **Slowly** open the drain tap and allow the oil to drain into the container for disposal.

7. Close the drain tap, disconnect the hose and remove the container. Refit the drain tap plug.

8. Close the air supply through the filler tube, open the control air isolating valve (lever to the horizontol position) and allow any pressure to be released through the normal blowdown process.

9. Remove the air supply and fitting from the filler tube.

10. Remove and discard the old oil filter element.

11. Apply a film of clean oil to the seal of a new oil filter element. Screw the element into the housing until it contacts the gasket and tighten a further $^{1}/_{3}$ turn.

12. Fill the separator to the correct level with BroomWade approved lubricant, refit the filler cap and tighten by hand.

13. Open the isolating valve to the user's system.

14. Run the compressor until it reaches working temperature to ensure full circulation of the oil.

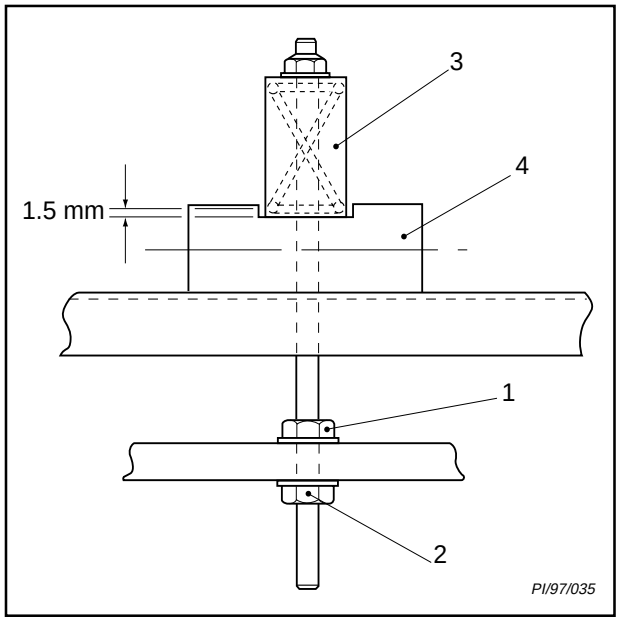
15. Check the oil level and top up as necessary.

3.5 Drive Belt(s)

The drive belt tension is set at the factory and requires no further attention.

When fitting a new belt adjust the tension according to the instructions below. Run the compressor for 30 minutes to allow the belt to settle into the pulley grooves then stop the compressor and re-tension the belt.

CAUTION: Any further tensioning will affect the life of the belt.



DRIVE BELT ADJUSTMENT

3.5.1 Adjustment After Fitting New Drive Belt(s):

1. Release the 1/4 turn fasteners and remove the LH side panel.
2. Loosen the lock nut (1) and turn the nut (2) clockwise until the adjuster (3) contacts the cut-out in the spring retainer (4).
3. Screw the nut (2) back one turn and tighten the lock nut (1).
4. Check that the gap between the adjuster (3) and spring retainer (4) is 1.5 mm.
5. Refit the side panel and secure the fasteners .

3.6 Electrical System

3.6.1 To Check the Electrical Connections:

Carefully inspect all the electrical wiring and check the security of all connections and terminals.

3.7 Electric Motors

3.7.1 Motor Bearings

The main drive motor is fitted with grease nipples and the bearings must be lubricated every 4000 hours.

The recommended grease for lubrication of the motor bearings is Esso (Exxon) Unirex N3 or an equivalent lithium complex grease.

Note: The bearings must not be over-lubricated.

The compressor must be stopped.

1. Locate the grease nipples and remove the dust caps.
2. Inject clean grease into the nipples with a grease gun. Remove excess grease.
3. Start the compressor and run for 5 minutes.
4. Remove excess grease and refit the dust caps.

3.7.2 Dust Contamination

If the compressor is operating in a dusty atmosphere it may be necessary to clean the motor windings periodically. The motor should be inspected at the service intervals to determine the cleaning frequency.

3.8 Suction Regulator

3.9 Minimum Pressure Valve

The servicing of items 3.8 and 3.9 should be carried out by a CompAir BroomWade Distributor.

3.10 Flexible Hoses

When fitting flexible hoses the nuts should be tightened using the torque appropriate to the nut sizes.

BSP Size	Torque
0.5 in	44 Nm
0.75 in	84 Nm
1.0 in	115 Nm
1.25 in	189 Nm
1.5 in	244 Nm
2.0 in	297 Nm

8

FAULT FINDING

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FAULT FINDING

In operation the compressor is protected by circuits which are triggered when a fault arises and either cause the compressor to shut down or indicate that a servicing action is required.

WARNING

- Refer to the safety procedures before carrying out any fault finding investigation on the compressor unit.
- Lethal voltages are used in this equipment. Use extreme caution when carrying out electrical checks. Isolate the power supply before starting any maintenance work.

1. FAULT INDICATIONS

1.1 Trip Fault Indications

Display	Meaning
L1 to L8 Flashing Quickly	Emergency Stop
L1 Flashing Quickly	Excess Pressure
L1 Flashing Quickly, Pressure Display shows (----)	Pressure Sensor Failure
L2 Flashing Quickly	Excess Temperature
L2 Flashing Quickly, Temperature display shows (----)	Temperature sensor failure
L6 Flashing Quickly	Drive Motor Fault
Display shows (≡)	Power Failure

1.2 Alarm Fault Indications

Display	Meaning
L2 Flashing Slowly	High Temperature
L3 Flashing Slowly	Service Due
L5 Flashing Slowly	Change air filter

2. SHUTDOWN FAULTS

Fault	Possible Cause	Action Required
Emergency Stop	(1) Emergency Stop Switch operated.	(1) Establish reason and rectify. Turn Emergency Stop switch to release latch and Press *RESET*.
Excess Pressure	(1) Compressor failed to unload.	(1) (a) Check air intake valve operation and diaphragm. (b) Check operation of load solenoid valve.
Pressure Sensor Failure	(1) Wire Connections. (2) Sensor failure.	(1) Check all pressure sensor circuit wire connections. (2) Renew sensor.
Excess Temperature	(1) Insufficient cooling air flow. (2) High ambient Temperature. (3) Oil cooler bypass valve. (4) Low oil level. (5) Incorrect oil grade.	(1) Check all panels secure. Check fan blades. Clean pre-filter. Clean coolers. (2) Check room ventilation. (3) Check for correct operation faulty. (4) Check for leaks and rectify. Top up oil to correct level. (5) Check oil grade, drain and flush oil system and service oil filter and oil separator elements.

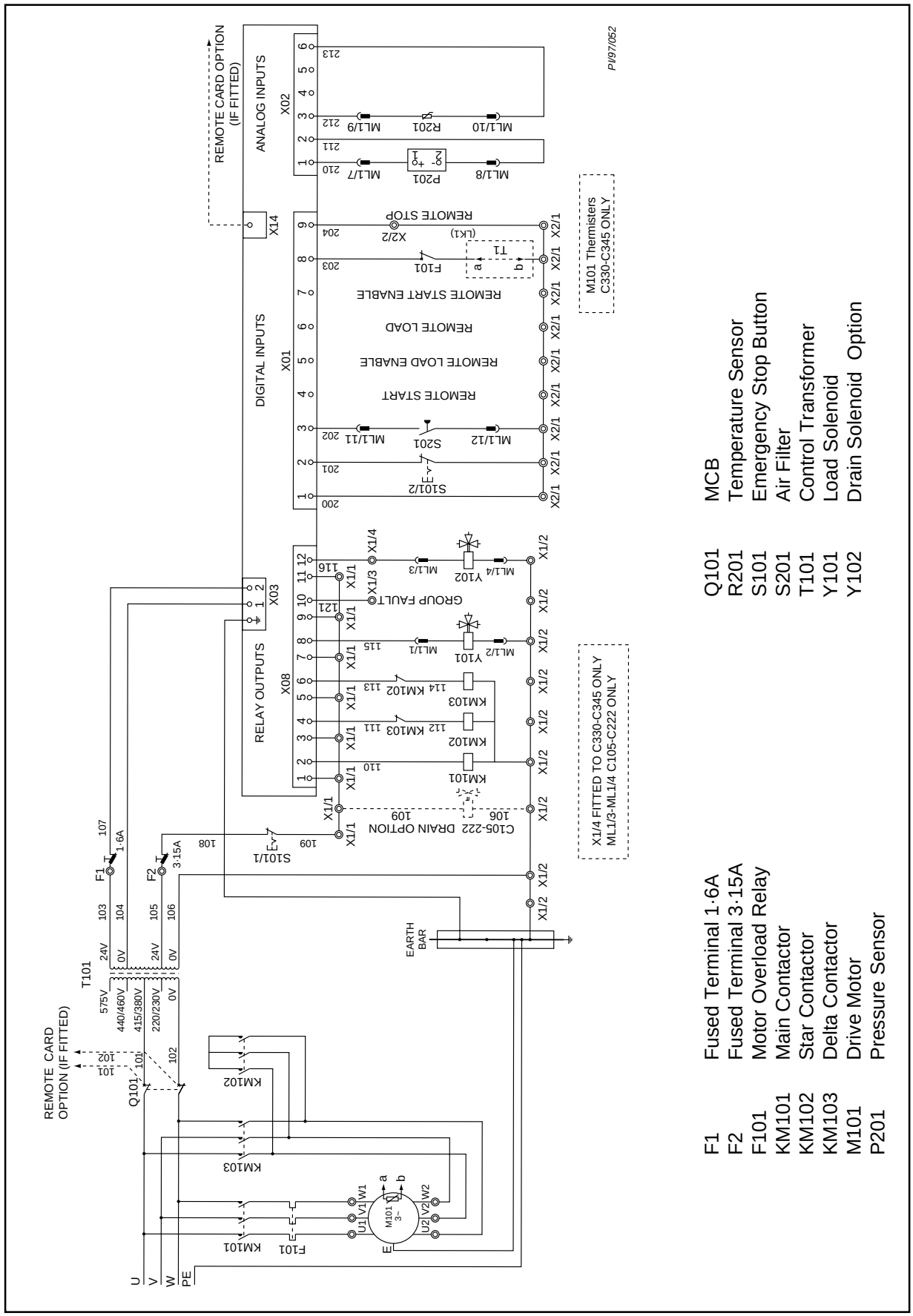
Fault	Possible Cause	Action Required
Temperature sensor failure	(1) Wire Connections. (2) Sensor failure.	(1) Check all temperature sensor circuit wire connections. (2) Renew sensor.
High Oil Carry Over	(1) Separator element. (2) Oil Drain Valve	(1) Fit new element. (2) Check valve closed. Replace valve and seal if necessary.
Drive Motor Fault	(1) Overload relay incorrectly set. (2) Insufficient cooling air flow. (3) High ambient temperature. (4) Low voltage/high current.	(1) Check setting and reset. (2) Check all panels secure. Check fan blades. Clean pre-filter. Clean coolers. (3) Check room ventilation. (4) Check main power supply.

3. ALARM FAULTS

Fault	Possible Cause	Action Required
High Temperature	(1) Low oil level. (2) Insufficient cooling air flow. (3) High ambient Temperature (4) Oil cooler bypass valve faulty. (5) Incorrect oil grade.	(1) Check for leaks and rectify. Top up oil to correct level. (2) Check all panels secure. Check fan blades. Clean pre-filter. Clean coolers. (3) Check room ventilation. (4) Check for correct operation. (5) Check oil grade, drain and flush oil system and service oil filter and oil separator elements.
Change air filter	(1) Intake air filter blocked.	(1) Renew air filter element.
Service due	(1) Routine service required.	(1) Carry out routine service and reset service interval timer.

APPENDIX 1

Electrical Connections



ELECTRICAL CONNECTIONS DIAGRAM

F1	Fused Terminal 1·6A	Q101	MCB
F2	Fused Terminal 3·15A	R201	Temperature Sensor
F101	Motor Overload Relay	S101	Emergency Stop Button
KM101	Main Contactor	S201	Air Filter
KM102	Star Contactor	T101	Control Transformer
KM103	Delta Contactor	Y101	Load Solenoid
M101	Drive Motor	Y102	Drain Solenoid Option
P201	Pressure Sensor		

APPENDIX 2

The Pressure Systems and Transportable Gas Container Regulations 1989

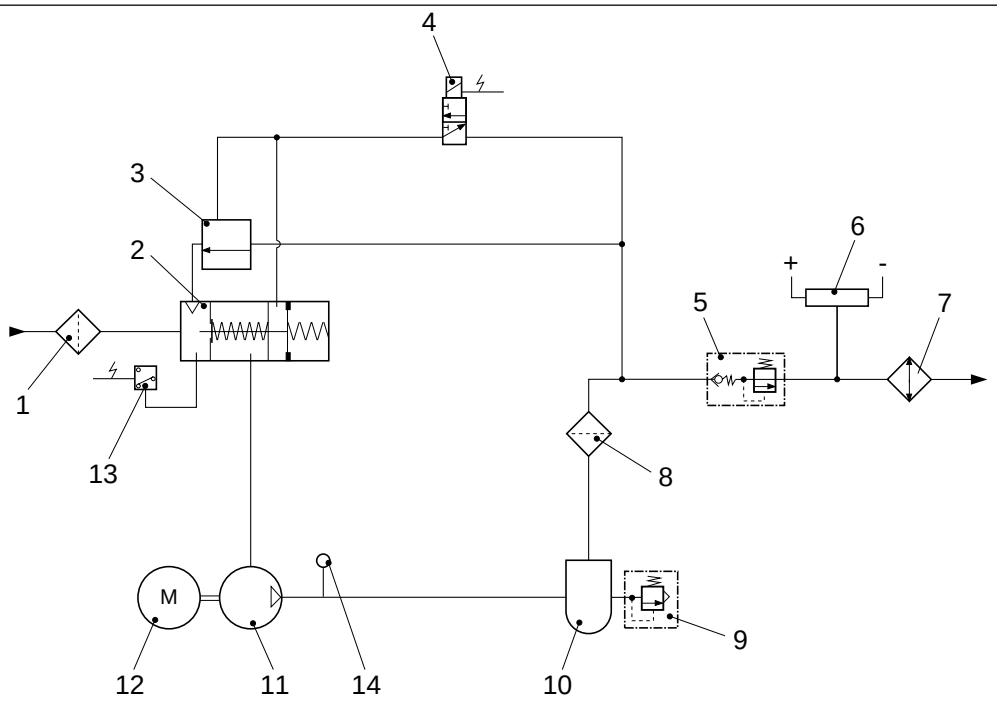
APPENDIX 2

THE PRESSURE SYSTEMS AND TRANSPORTABLE GAS CONTAINER REGULATIONS 1989

The circuit diagram shown below is provided to assist a 'competent person' in preparing a written scheme of examination for a system incorporating the air compressor(s).

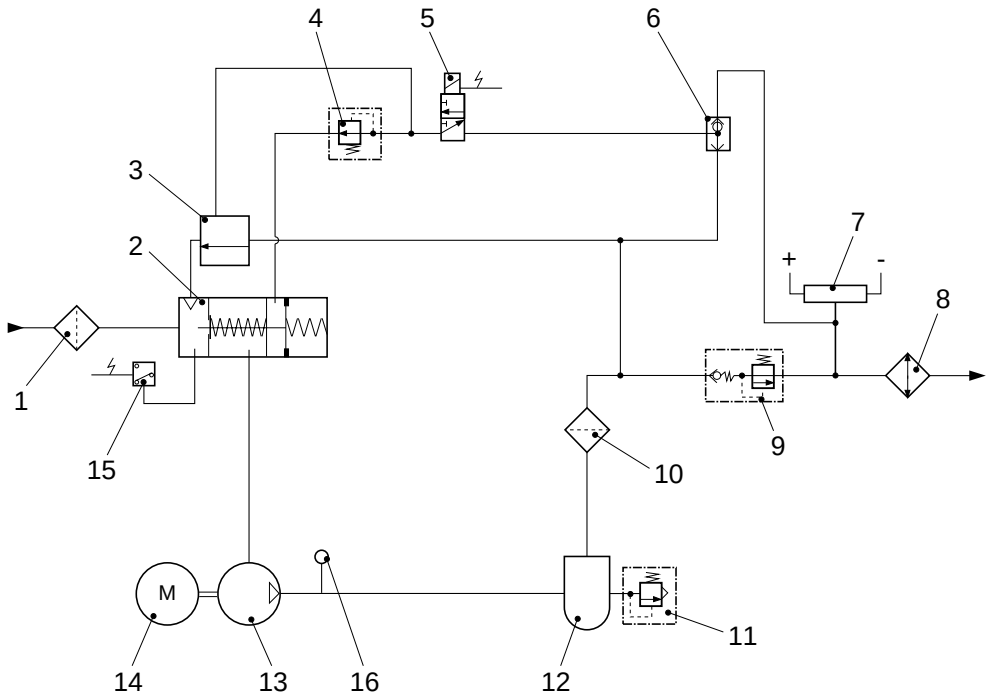
Note: The intervals between examination and calibration of components, eg pressure vessels, pressure relief valves etc, will be defined by the 'competent person' preparing the written scheme.

In defining these periods the 'competent person' must take into account the recommendations of the component part manufacturer, the Health and Safety Executive (H & SE) and the British Compressed Air Society (BCAS).



1. Air Intake Filter
2. Suction Regulator
3. Venting Valve
4. Unloader Solenoid Valve
5. Minimum Pressure/Non-return Valve
6. Pressure Transmitter
7. Aftercooler
8. Separator Filter
9. Pressure Relief Valve
10. Separator Vessel
11. Air-end
12. Drive Motor
13. Intake Pressure Switch
14. Air-end Discharge Temperature Sensor

AIR COMPRESSOR CIRCUIT DIAGRAM – ON/OFF CONTROL



1. Air Intake Filter
2. Suction Regulator
3. Venting Valve
4. Negative Regulator
5. Unloader Solenoid Valve
6. Shuttle Valve
7. Pressure Transmitter
8. Aftercooler
9. Minimum Pressure Valve
10. Separator Filter
11. Pressure Relief Valve
12. Separator Vessel
13. Air-end
14. Drive Motor
15. Intake Pressure Switch
16. Air-end Discharge Temperature Sensor

AIR COMPRESSOR CIRCUIT DIAGRAM – MODULATING CONTROL